SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE, PUBLISHED MONTHLY

VOLUME VIII FEBRUARY, 1909 NUMBER 2

MODERN MILITARY SURGERY[1]

BY THE LATE NICHOLAS SENN, M. D., CHICAGO, ILLINOIS

THE study of military surgery is very much like traveling through a dense tropical forest. When we go way back to its beginning, we are surrounded by darkness, and feel the humid air of antiquity. Not a ray of light penetrates the interlacing branches and dense foliage overhead. We grope our way through the labyrinth of trees and jungles, and look in vain for a glimpse of light. The sun of science is shut out by the rampant vegetation of ignorance and superstition. As we proceed through the pathless, somber forest, the thickets become thinner and thinner, the spaces between the trees widen, and we see here and there the powerful rays of the sun find their way through chinks in the leafy bower, and cast a streak of dazzling light in the humid air, and over a limited space on the grassless, mouldering, untrodden carpet of the forest. These beams of light become more frequent, larger, and more luminous as we come nearer to the verge of the forest; and when this is reached, we face a vast, verdant, treeless plain, radiant in the dazzling light of the noonday sun. Darkness has given place to light; the old to the new. We have arrived at the new era of military surgery. From now on, we will travel over well-made highways, illuminated by the never-fading light of scientific research and rational methods of practice. Modern military surgery is nearly coeval with the discovery of the true nature and essential cause of wound infection. All innovations in the treatment of gunshot wounds, made before the principles of antiseptic and aseptic surgery were understood and practiced, were of a routine and empirical nature. The mystery of wound infection, which puzzled the brightest minds for centuries, was solved when it was demonstrated, by experiment and clinical experience, that all inflammatory wound complications are caused by pathogenic bacteria, and not by the admission of air into the wound or the presence of a miasm, as was formerly supposed. The new era of surgery was inaugurated by the scientific researches of two men — the late Professor Pasteur and Professor (now Lord) Lister. Pasteur demonstrated in his laboratory, that spontaneous generation does not occur, and that all putrefactive and fermentative processes are caused by the presence of minute vegetable organisms. Lister profited by these experiments, and came to the conclusion that wound infection is nothing else but a fermentative or putrefactive process, caused by the presence and pathogenic action of living micro-organisms. The result of his experimental researches confirmed this belief. When this question was settled in his mind, he devised a method of wound treatment, based on this foundation. Carbolic acid was the germicide he selected. Carbolized putty and carbolized linseed oil were his first antiseptic preparations, and which he

[1] EDITOR'S NOTE.— This is a third of a series of articles written for SURGERY, GYNECOLOGY AND OBSTETRICS upon Military Surgery by the late Professor Nicholas Senn. A fourth article, upon "The Evolution of the Military Surgeon," will follow in a subsequent number.

used and recommended forty years ago. At first, he placed too great stress on the presence of micro-organisms in the air, and the carbolic spray was the result. This cumbersome invention was given an extensive trial, and was soon discarded; as it became known that infection is, almost always, the result of contact with the wound of contaminated fingers, instruments, dressing material, ligatures, or imperfect disinfection of the field of operation. Antiseptic surgery, as taught by Lister, soon became aseptic surgery as perfected by himself, and by von Volkmann, von Nussbaum, and others in Germany. Besides being the founder of antiseptic and aseptic surgery, we owe to Lister a lasting debt of gratitude for the general introduction of the absorbable aseptic animal ligature, which von Nussbaum calls "Lister's greatest invention."

Surgeons, in all civilized countries, have made contributions to the simplification and perfection of the aseptic technic, and military surgeons have added their good share in revolutionizing completely the treatment of gunshot wounds. Before we take up the modern treatment of gunshot wounds, we must discuss, first,

THE RECENT IMPROVEMENTS OF FIREARMS

In a former article, we traced the evolution of firearms to the invention of the percussion cap, and the introduction of the needle-gun in the Prussian army. Since that time, there has been a rapid progression of improvements in the construction of firearms, and the manufacture of powder and projectiles. Since 1885, there has been a great improvement in small arms, the most important being the substitution of magazine-guns for the single-loader, the decrease in the caliber of the barrel, and the adoption of smokeless in place of the black powder formerly in use. Fouling of the barrel led to the use of smokeless powder, which had become a necessity for the use of the rapid-fire guns. The weight of the modern rifle has been reduced, the barrel being of less interior diameter, and also somewhat shorter. The majority of the barrels of the modern arm are rifled with four spiral grooves (though some have only three and others six or seven), of a depth, varying in the different countries, from 3.003 to .006 inch. As leaden bullets, fired with high velocity through such barrels, will not follow the rifling, but will strip and override the lands lead, it became necessary that the surface of the projectile be made of some harder metal; but to retain the high specific gravity of the lead, with the consequent ability of the ball better to overcome the resistance of the air, the greater part of the new bullet is made of hard lead slug, and then mounted with a jacket, about .02 inch thick, of some harder metal, as steel, copper, nickel, German silver. The hardening of lead, by mixing it with other metals, did not prove satisfactory for the small-caliber firearms. More than fifty years ago, the wild hordes of the Caucasus used a small bullet, made of copper, and its effects were as destructive as those of the large leaden bullet used at the same time. The French have recently made use of the same metal, in the manufacture of small-caliber projectiles for their army. It has no hard metal jacket, and is made longer than the jacketed bullet of the same caliber, in order to make up for its requisite weight, as copper has a lower specific gravity than lead. The jacketed bullets, now in general use by the armies of all nations, have a length of about four calibers, are without the transverse grooves, or lubricast, of the lead ball, and weigh on the average about 220 grains. The caliber of the bullet of different nations varies slightly, in order that, in case of war, the victors cannot make use of the ammunition of the vanquished. The penetrating power of the bullet, at all distances, has been increased by the employment of the more powerful smokeless powders, and the alteration in its shape, by its harder and smoother surface. At the shorter ranges, 200 to 300 yards, protection is now secured by about .2 inch of steel plate, and about .3 inch of wrought-iron, or 11 inches of loose earth. Dr. J. D. Griffith has demonstrated, by his numerous experiments, that loose earth will stop the bullet at short range, at a depth of from 10 to 11 inches. The soldiers on the field of battle can protect themselves against the fire of the enemy by digging small trenches, and lying down behind the diminutive works thrown up by using the new bayonets, which in reality are knives and spades, with blades

from 9 to 12 inches long and about an inch wide. The different modern military rifles mark the culmination of an evolution, extending over a period of more than forty years, beginning with a small arm that could deliver about two shots per minute, and had a range of about 200 yards. Twenty years later, the muzzle-loading smooth-bore having given place to the rifle breech-loader, the number of shots and the efficient range were increased tenfold; and then the small-caliber magazine-rifle succeeded, with a range of about 4,000 yards, and capacity, in expert hands, of firing nearly forty shots per minute. The fire of these modern rifles is wonderfully accurate, and the soldiers of all armies are thoroughly drilled in marksmanship; consequently these weapons become dangerous with a shooting space of more than two miles between the fighting lines. Much has been said for and against the new weapon as a human arm. Its killing power at certain ranges is great; as a stopping weapon, the old large-bore musket, fired at close range, was more effective. The new small-caliber rifle is a more humane weapon, in so far that it either kills outright or the wounded have a much greater chance of recovery. The small conical bullet, of high velocity and great penetrating power, does not carry with it, into the tissues, foreign substances to the same extent as the large-caliber round and conical leaden balls, of low velocity and feeble penetrating power. Long before the modern small fire-arm had been employed to any extent on the battle-field, surgeons made experiments with it on cadavers, animals, and different inanimate objects, in order to determine the effects of the small-caliber bullet and the character of wounds it would inflict if employed in war. We will now pass in rapid review the most notable

RECENT EXPERIMENTAL STUDIES ON GUNSHOT WOUNDS

During the last fifty years, inventors of firearms have sought to reduce gradually their caliber and weight, and aimed to increase their range and effectiveness. These successive changes in the construction of the small weapons have revolutionized the character of gunshot wounds. The Minié rifle, a formidable weapon, had a caliber of 18 mm., the Prussian needle-gun 14 mm., and finally, that of the Mauser was reduced from 11 mm. to 7.5 and 8 mm. In proportion as the caliber was reduced and the weight of the bullet diminished from 50 grams to 15 grams, the velocity of the projectile was increased. The velocity is the main factor of the living power, with which the projectile reaches its aim. The substitution of the smokeless for the black powder has contributed its large share in increasing the velocity and penetrating power of the bullet. By these combined means, it has been made possible to increase the initial velocity from 400 to 600 metres per second, and to increase the range to 4,000 metres. The shape of the new bullet is also calculated to overcome, to a maximum extent, the resistance offered by the air, as its length is about four times that of its diameter, and the rifled bore imparts to it rotary movements of from 800 to 2,500 per second. The effects of the small-caliber bullet correspond with three well-marked zones. The first zone, up to 400 metres, is the explosive range, within which fearful wounds are inflicted.

But even these are not as severe as those produced with the old leaden bullet. Within this range, wounds of soft parts correspond about with the size of the bullet, and no funnel-shaped increase in size, in the direction of the wound of exit, is observed; in other words, there is not much difference in size between the wound of entrance and exit. The explosive effects on bone do not reach the extent of those inflicted by the old weapon. Within this range, the compact portions of the large long bones always show extensive splintering, but in flat bones drill perforations, with or without fissuring, are the rule. The second zone covers the distance from 400 to 800 metres. Within this range, the explosive effects are only seen in gunshot injuries of the skull; all other wounds are noted for the absence of extensive destruction of tissue, including the bones. The third zone extends from 800 to 1,200 metres. Injuries inflicted at this distance are comparatively slight. The bullet cuts a clean track. The wounds of entrance and exit diminish in size with the increase of distance, the former being a small circular

defect, 5 mm. in diameter, and the latter often a small slit, 6 to 7 mm. in length, so small that it may be difficult to find it. The bone injuries are drill holes or furrows without splintering.

Beyond this zone, 1,200 to 2,000 metres according to Hobert and Delorme, destruction of bone becomes more extensive. Even at this distance, bullets seldom lodge in the body. The above is a summary of the results of experimentation by different authors concerning the range and effects of the small-caliber jacketed bullet.

Let us now inquire into the results obtained by individual experimenters. As early as 1867, Verneuil called attention to the comparatively benign nature of wounds inflicted by small-caliber weapons. He had observed that in such instances there is little tearing of tissue along the track made by the bullet, and not much splintering of bone.

Kirker, according to his observations during the Turco-Russian war, came to the conclusion that the cylindro-conical bullets do not destroy bone more extensively than the round bullet. His experiments, made later, proved the correctness of his clinical observations.

Longmore was induced, by Kirker's experiments, to make trials with the Martini-Henry rifle. Wounds made with this arm were larger, and the comminution and fissuring more extensive, than in Kirker's experiments. The wounds, on the whole, were less severe than those produced by the Enfield rifle, as the laceration of soft tissues was less and the fragments of bone were not as widely dispersed. The Enfield bullet has a diameter of .55 of an inch, and consists of pure lead. The Martini-Henry bullet is made of hard lead, of about the same diameter, but is not so destructive to bone as the Enfield bullet. The mantled bullets have a penetrating power three to four times greater than the leaden bullet. Reversin made experiments with the Rubin rifle, firing a bullet 7.5 to 8 mm. in diameter and 32 mm. in length, composed of hardened lead, ensheathed with a mantle of copper, leaving only the point of the lead exposed. The initial velocity is 542 to 563 metres per second. On the cadaver, this bullet made very small wounds of entrance and exit, often in the form of a small linear slit.

Von Beck studied thousands of wounds, inflicted with the Chassepot rifle of the French army, during the war of Germany with France, and found them different from wounds produced by any other firearm, in that the explosive effect of the bullet caused great destruction of the soft parts around the track made by the bullet. The suspicion was entertained at the time that the French used explosive projectiles, but examination of the bullets, after the war, showed that they were made of pure lead, with only a trace of iron or copper. He satisfied himself that these destructive bullets did not burn the tissues and the lead was not affected by the fire.

Busch has made a scientific study of the flight of the Chassepot bullet. He estimated that after the bullet leaves the rifled tube it makes one rotation to each half-metre it travels. Its initial velocity is 420 metres per second, and during this time makes 800 rotations. He believes that the lead, softened by heat, gives off particles as the bullet passes through the tissues, and in this manner greatly increases the damage inflicted by increasing the zone of injured tissues, soft and hard, around the perforation made by the bullet.

Küster has confirmed the observations of Busch, on the effects of the Chassepot bullet. When the bullet is fired at close range, on a resisting body, it splits into several pieces, the fragmentation being due to heat. The destructive effect of this arm is frightful. He also has shown that the Mauser rifle inflicts wounds which bear a close resemblance to that made by the Chassepot. In opposition to Busch, he claims that the lead is not heated to the melting-point, an opinion which was also upheld by the late Professor von Wahl. Heppner and Garfinkel attribute the extensive destruction of soft tissues in the direction of the wound of exit in gunshot fractures more to the action of the bone fragments than to the particles of lead thrown off from the bullet. They came to this conclusion by making experiments with the Martini-Henry rifle, which carries a bullet made of hard lead.

Bornhaupt examined 600 specimens of gunshot wounds of the long bones from different European war, and did not find a single one which bore the resemblance to a drill hole,

as in all of them there was more or less fissuring. His experimentsaon the cadaver yielded the same results. He thinks the wedge action of the modern projectiles explains more satisfactorily the mechanism by which the long bones are so constantly fissured.

In 1874, Kocher made numerous experiments to determine the explosive effect of the small-caliber bullet. His results with the Vetterli rifle, with which the Swiss army is armed, were very similar to those of Busch with the Chassepot, as the weight, size, and the initial velocity of the bullets of these two arms are nearly the same. The experiments were made on boards, closed books, iron plates, tin and glass vessels, empty and filled with different media, intestines and pigs' bladders, filled with water, tibia and femur of ox, from which the marrow had been removed, empty macerated skulls, spongy bones, and soft tissues of the cadaver, macerated and intact skull, and skulls opened and closed again. The conclusions which these experiments led to are formulated by Kocher as follows:

The melting of lead, caused by the transformation of a considerable part of the velocity into heat, takes place. This effect can be seen only in gunshot wounds of bone by the dispersion of particles of lead, and the propulsion of fragments of bone, making a funnel-shaped tract in the bone and soft tissues in the direction of the wound of exit. The destructive effect of the bullet depends, however, principally on the hydrostatic pressure, caused by the sudden displacement of the incompressible fluids contained in all of the tissues of the body. This hydrostatic pressure is due to the great velocity of the projectile, as compared with the old bullet fired from a smooth bore. All tearing and contusions of the soft parts, and the comminution of bone, in the manner described in the experiments, are due to hydrostatic pressure.

In a second series of experiments, Kocher ascertained some new facts which induced him to modify to some extent his views concerning the destructive effect of the small-caliber bullet. He determined that hard lead bullets are more destructive than soft lead bullets.

Hydrostatic pressure is intensified by the degree of velocity of the bullet, its caliber, and the amount of fluid contained in the object fired upon. If a bullet passes through a bone, the particles of scattered lead and bone fragments, carried before the bullet, increase the area of injury in the soft tissues and size of the wound of exit. Bullets with low velocity cause no hydrostatic pressure. In wounds, made by bullets of equal velocity, the size of the bullet determines the extent of destruction; that is, the larger the bullet, the more severe the wound. Conical bullets retain their initial velocity longer than spherical bullets. The practical deduction which Kocher draws from his experiments consists in his recommendation to use in war a bullet which will disable the soldier, but which inflicts no unnecessary injury. The Swiss army uses a bullet made of 99.5 per cent of lead, and half of one per cent of antimony, rendering the lead hard, and less subject to melting by heat. The velocity of the projectile should not be increased beyond the present height. He regards projectiles made of copper or iron as least destructive, and recommends that these metals should be used for the manufacture of bullets to be employed in future wars, in order to render warfare as humane as possible. Reger recommended bullets of lead, hardened by the addition of tin, zinc, or bismuth. Bovet made experiments with the Hebler (Zurich) rifle, caliber 7.55 mm., bullet hard lead (lead 97, antimony 3). This arm has an initial velocity of 607 metres per second, while the Vetterli has 435 metres; Mauser, caliber 11 mm., 459 metres; caliber 9 mm., 558 metres; Rubin, 7.5 mm., 563 metres. He ascertained that the slow combustion of the smokeless powder did not increase the gas pressure above 2,000 atmospheres. The jacket of the Hebler bullet is not soldered, and possesses an enormous resisting capacity, and in striking the hardest objects, the mantle remains attached to the lead, and very little if any deformation takes place. He experimented with all kinds of objects, including carcasses of animals; and among other things, found that the penetrating power of bullets fired from this weapon is two to three times greater than that of the Vetterli rifle.

Hobert's experiments were made with the 8 mm. Männlicher rifle, firing a mantled

leaden bullet. The results differed somewhat from those of Bovet, Bricher, and Delorme.

The bullet of the old French weapon, the Gras rifle, has an initial velocity of 379.5 meters. I saw a great many, wounded by this arm, in the military hospitals of Constantinople, during the Greco-Turkish war. As the Greek army was armed with this weapon, all of the wounds presented the usual appearances of injuries inflicted by low-velocity, large-caliber bullets. Chauvel made experiments with the Lebel gun (Model 1886), caliber 8 mm., ball mantled with German silver. The 43 experiments were made on fresh cadavers. Eighteen times the firing was done at a distance of 1,200 to 2,000 metres, 13 times at 600 to 1,000 metres, 10 times at 200 to 400 metres, and 2 times *à bout portant* distances, at which, according to Chauvel, firing will take place in future wars. At the same range, the size of the wound and extent of injury of the soft parts and bones were less than wounds made with the Gras gun.

At long range, the injuries of the compact bones are relatively more extensive than at short range; but in the former the bone fragments are separated from the periosteum, while in the latter a real loss of substance takes place by destruction of the periosteum and dispersion of the fragments. According to his observations, the new small-caliber jacketed bullet does not scatter the fragments in the direction of the wound of exit as much as the leaden bullet. At a range of 1,200 to 2,000 metres, the Lebel weapon inflicts less extensive and less grave wounds of the soft tissues and bone than the leaden bullet of the old firearms. At short range, 200 metres and less, their effect is nearly the same as that of bullets without a jacket. In the middle zone, 400 to 1,200 metres, the humanitarian claim of the new bullet depends largely on the absence of deformation of the projectile, a circumstance which diminishes its destructive effect, and in preventing the lodgment of the bullet in the body. At all ranges, the liability of the bullet remaining in the tissues is small; and thereby one of the sources of anxiety on part of the wounded is removed.

Cardenal made experiments with the Mauser rifle (Spanish model). The initial velocity of the bullet is 700 metres per second, and the projectile, during this time, makes 3,300 rotations, and has a range of over 4,000 metres. At 30 metres, the bullet made, in a dry skull, perforations the size of the projectile, at the entrance and exit, with very little fissuring of the bones. When the skull was filled with a gelatinous mass, resembling approximately the consistence of the brain, and wrapping the skull in a cotton cloth, the bullet tore the cloth into shreds, and the skull was blown into fragments. These experiments satisfied Cardenal that the bullet retains some of its hydrostatic explosive effect, even at a distance of 2,000 metres, and that there is no zone in which the skull escapes entirely the explosive effect of the bullet.

Bruns made experiments on cadavers with the Mauser rifle, using a bullet of lead encased in a nickel jacket. He found the penetrating power of the bullet so great that at a short range it perforated an iron plate 12 mm. in thickness, and at 800 metres, one 2 mm. in thickness. He estimated that at 100 metres the bullet would pass through four or five men placed in line. At short range the explosive effect is much less than of the weapons formerly in use. His experiments showed that the small-caliber jacketed bullet at short range is deformed only when it strikes the hardest and most compact bones.

Drill perforations in the large bones, he found only in very exceptional cases.

When living horses were used for the experiments, twenty per cent of the bullets had their mantles torn by striking bone. The large, long bones were usually found extensively fissured by the bullet. His experiments also showed that even the empty intestines do not escape the bullet. In two instances, the firing at the human cadaver was done at 1,000 and 2,000 metres, and the bullet was found lodged underneath the skin on the opposite side; thus showing that at these ranges the bullet may lodge in the body. Bruns also made experiments with the Mauser pistol on different objects, and found that within a range of 200 metres the bullet inflicts dangerous wounds and extensive splintering of bone, and much tearing of the soft tissues. At a distance of 100 metres, the strongest bones are fractured.

At close range, the penetration is so great that the projectile would pass through three men standing in a line.

GENERAL REMARKS ON CHARACTER OF WOUNDS INFLICTED BY THE SMALL-CALIBER MANTLED BULLET

Although the experimental work with the small-bore modern military rifle has not yet yielded uniform results in the hands of different investigators, it has settled certain important practical facts with which surgeons should be familiar. The death-carrying range of these weapons exceeds the distance of two miles. The velocity of the bullet and its great penetrating power combine to inflict clean-cut, tubular wounds, with a very limited zone of contused tissue, if the bullet reaches its aim direct, and if it does not strike any metallic substance of the accoutrement of the soldier or a bone in its passage through the body. In such instances the wound of entrance and exit are small, and there is not much difference in their size. In some of these cases the wound of exit is a very small slit, often difficult to find. I met with a number of such wounds in Cuba, after the battle of San Juan Hill, and saw a number of gunshot wounds in the military hospitals of Athens, during the Greco-Turkish war, which presented the same appearances. These wounds were made with the Mauser rifle, which was the arm of one brigade of the Turkish troops. Ricochet bullets are usually deformed before they strike the body, and hence produce much more tearing and a larger wound than the direct bullets. The cutting action of the new bullets, as compared with the old ones, is more likely to injure blood-vessels and cause serious primary hemorrhage, and later aneurysm. The presence of powder in the wound, which gave so much concern to the military surgeon in former times, when black powder was used and the firing done at close range, is out of consideration in modern warfare. We may safely assume that within a range of 1,500 yards few direct bullets lodge in the body, and consequently few temptations are presented to the surgeons to make use of probe and finger in search for bullets, and the wounded are saved one great source of anxiety, as the public at large, and soldiers in particular, still consider the presence of a bullet in the tissues a binding indication to find and remove it at all hazards. If the bullet strikes a bone at a distance which corresponds to the first zone, its explosive effects are pronounced, and we may expect to find extensive destruction of the bone and the soft tissues on the distal side of the fractured bone, torn by the bone fragments in advance, and on the sides of the passing bullet, and in consequence of this, a large and everted wound of exit. None of these bullets are as destructive to the periosteal envelope of bone as the old round and conical bullets of lead. The greatest amount of destruction of the soft parts and bones is produced by bullets beyond the third zone, on account of the wabbling action of the projectile, and the most favorable wounds are produced at a range which corresponds with the second or middle zone. The modern bullet is seldom, if ever, deflected; while the low-velocity leaden bullet often pursued strange routes in its passage through the tissues, being deflected by bone, tendons, and dense aponeuroses. The small-caliber jacketed bullet seldom carried foreign substances into the wound which require extraction, as was the case with the large low-velocity leaden bullets. The explosive action of the high-velocity bullet is due to hydrostatic pressure; and is most pronounced at short range, and when it strikes the skull and the internal hollow viscera filled with fluid.

PRINCIPLES WHICH GOVERN THE MODERN TREATMENT OF GUNSHOT WOUNDS

The most successful military surgery is conservative surgery. Experiments made by firing bullets under proper precautions through nutrient media, enclosed in a sterile receptacle, as well as the large clinical experiences during several wars of recent times, have abundantly demonstrated that the small high-velocity bullet inflicts wounds which are practically aseptic. Operative surgery, with the exception of an occasional tracheotomy in wounds of larynx and trachea, where life is threatened by asphyxia, and ligation of large bleeding vessels, has been banished from the battlefield. Bullets lodged in the body are allowed to remain where they are until they become a

source of danger or suffering, when their exact location is ascertained by the use of the X-ray in a well-equipped hospital, where they are removed if an operation is deemed feasible and safe. The probe and finger as searchers for bullets are absolutely prohibited on the battle-field. The prudent military surgeon contents himself in protecting the wounded against subsequent infection, by applying the first-aid dressing as soon as possible after the injury has been received, immobilizing gunshot fractures by extemporaneous dressings, combating shock, arresting hemorrhage, removing the wounded to a place of safety, and transporting them as speedily as possible to the field hospital.

Primary amputations are only resorted to in instances in which a limb is shattered or injured in such a manner that gangrene would inevitably ensue. Primary resection of large joints for gunshot injuries is no longer permissible, because experience has shown that penetrating wounds, even with extensive comminution of the articular ends, heal in the most satisfactory manner, and with excellent functional results, provided infection is prevented by prompt first-aid dressings, and the joint is placed at rest by immobilization of the injured limb.

Truly, the crowning glory of military surgery has been reached by the adoption of the most radical conservatism, guaranteed by resorting to a primary wound treatment, which has for its main object the prevention of infection.

IMMEDIATE OPERATIVE TREATMENT OF CERTAIN FRACTURES

By LEONARD FREEMAN, M. D., Denver, Colorado

OPERATIONS for non-union in fractures, and for deformities resulting from faulty union, have been practiced for a long time; but it is only in later years that attention has been given to the open treatment of recent fractures, owing doubtless to the dangers of infection.

From extensive investigation in the London hospitals, Lane has called attention to the large number of men whose earning-capacity has been lessened by the faulty union of broken bones, manifesting itself in pain and discomfort; and there are few practitioners of experience whose observations have not led them to similar conclusions.

Seeing that it has proved to be impracticable to correct this state of affairs by non-operative methods, it seems reasonable that more attention should be given to operative procedures, without, of course, going too far in this direction. The question is not only of importance to the patient, but it is also of moment to the physician, because his reputation is so easily ruined by a bad result; and especially is this true since the advent of the X-ray. A cripple in a community is an advertisement of a doctor's incapacity, and is a source of constant embarrassment, to say nothing of the danger of suits for malpractice so common in connection with these cases.

Formerly we were justified in doing the best we could with ordinary methods, relying upon the invisibility of the bones as an excuse for their faulty adjustment and as a protection against the criticisms of patients; but since the appearance of the X-ray, there is no longer an excuse for not recognizing a bad position of fragments. In fact, the situation is this — if the surgeon fail to obtain a skiagraph, the patient will do so later on, and in case the slightest deformity is revealed he is sure to ask the embarrassed practitioner why the picture was not made in the beginning. Hence it should be the custom, in the interest of self-protection, if nothing more, to suggest an X-ray in every case of injury where a fracture might exist, even though it cannot be detected, and also whenever there is the least question as to the proper adjustment of fragments. Not that it is invariably necessary or desirable to replace bones exactly as they were before they were broken; but it is always better for the

surgeon to recognize the situation and explain it properly to the patient than for the latter to find it out for himself in the future.

In considering the operative treatmeat of recent fractures, a number of propositions require attention:

1. *No recent fracture should be operated upon that can be successfully treated by other means.*

In accepting this dictum, however, certain limitations must be recognized. For instance, although in a given case it might be possible for a skilled specialist to get good result with the proper appliances correctly used, will it or can it be done in this particular instance? What the patient wants is results, and not theoretical possibilities. If the chances seem to be against success without operation, then it is surely better to operate!

2. *No recent fracture should be operated upon except under the most favorable surroundings and by an experienced surgeon who is a master of aseptic technique.*

The danger of sepsis in lacerated and contused tissues, with exposure of the medullary cavities of bones, is too great to permit of unskilful handling; and even under the best of circumstances Eisendrath is hardly warranted in saying that the risk is in general no greater than that of an interval operation for appendicitis, although this would certainly apply to many cases.

3. *The resisting-powers of the patient should be taken into careful consideration.*

This means the condition of the urinary, respiratory, and circulatory systems, as well as the age; remembering, however, that one individual may be younger at 80 than another is at 50.

4. *The patient's position and duties in life deserve attention.*

Those whose occupations necessitate much standing and moving about require an especially careful adjustment of fractures of the lower limbs with regard to the distribution of weight, or else their earning-capacities will be reduced by the discomfort produced by strains upon muscles and joints — an all too common occurrence. The life-prospects of an individual may also be seriously influenced by an improperly set fracture of the upper extremity, limiting the movement of a joint or the carrying capacity of an arm. It should never be lost sight of that these unfortunate results can usually be avoided by a timely and skilful operation.

5. *The success of operative intervention depends much upon the accessibility of the fracture — the danger varying directly with the amount of manipulation required.*

The mortality, for instance, of operations upon the femur is considerably greater than when the tibia or other more superficial bones are concerned; and delayed union is more common, owing to the necessary disturbance of the tissues in a deeper wound.

6. *It should be recognized that faulty alignment and overlapping of fragments, or even the presence of visible deformity, do not always mean disturbance of function.*

This is so true, for instance, of the clavicle, that no matter what the position, it is seldom necessary to operate to avoid interference with function, and the same thing may be said to a less extent of most other bones, including even the tibia and femur. In fact, every one is familiar with cases of marked deformity of various bones co-existent with perfect usefulness. The necessary factor in the extremities, provided a joint is not involved, is that the distribution of weight should correspond with the axis of the limb in standing or in carrying things in the hand, thus avoiding strain; and this must always be kept in view in estimating the desirability of an operation.

The presence of deformity, however aside from mere function, is surely of some importance, for many people dislike to realize that they are afflicted with a striking physical imperfection, especially when it is visible to others.

7. *In estimating the value of an operation, the after-treatment deserves consideration; will it be rendered less trying to the patient or give a better result in a shorter space of time.*

No general rule can be proclaimed in this connection. Each case must be regarded individually, according to its nature and the peculiarities of the patient. As an illustration, Bardenheuer employs very heavy weights in his extension-treatment, perhaps as much as 50 or 60 pounds in fractures of the thigh. While some may bear this with but little in-

convenience, it may be the cause of great suffering in others. And in addition, when it is necessary to use heavy weights or great pressure with splints, the muscles and joints can suffer to such an extent that prolonged or even permanent disability may result. In fact, the effect of tight splinting is too often observed in ischemic paralysis, a condition which frequently cripples the hand for life. Recently I saw two such cases in one day!

When the fragments are securely united by operation, the after-treatment is usually much simplified. Extension is seldom required, tight splinting is unnecessary, and massage and passive motion can be instituted early enough to insure a rapid restoration of function. In short, by operating in well-selected cases better results can be obtained and much unnecessary suffering and inconvenience prevented.

8. *The indications for operation vary greatly with the particular bone which is broken, the character of the break, and its situation in the bone.*

The clavicle, for instance, seldom requires operation, and then more for cosmetic than for functional reasons; while evulsions of the tuberosities of the tibia, humerus and os calcis, and fractures of the surgical neck of the humerus with dislocation or rotation of its head should nearly always be treated by the open method. Breaks of the olecranon and patella occupy an intermediate position; but operative intervention has become so common that it is generally in place, even if not always necessary. Fractures of the skull, spine and femoral neck require special consideration and will not be discussed here.

It is seldom desirable to operate upon transverse breaks in the shafts of long bones, as they can usually be successfully treated by splints or by extension. This is fortunate, owing to the danger of delayed union in the diaphyses which is almost never met with in the epiphyses. When an operation is demanded upon a diaphysis it is generally because of an oblique or spiral fracture, where extension is most apt to fail, or because of a portion of muscle between the fragments.

The greatest necessity for operation is found in fractures of the epiphyses; because of interference with joint function — from the ends of the broken bones, from loose fragments, or from excessive callus. Especially is this true of the lower extremities of the humerus and the femur. In these situations unsatisfactory results, in the shape of anchylosed, painful and more or less useless joints, are all too familiar to every practitioner of experience.

9. *Admitting the desirability of operating in certain carefully selected cases, it must not be forgotten that there are two important drawbacks — delayed union and sepsis.*

It is certain that delayed union is more common after operation than when fractures are treated by ordinary means. Although this is due in part to interference with the periosteum, and perhaps to the presence of foreign bodies, such as wires, these are not the sole reasons; because, as I have experienced, it occurs when the periosteum is not disturbed and when no wires are employed. It is probable, as recently emphasized by Fritz König, that the tendency to union is greatly stimulated by the presence of extravasated blood and pieces of devitalized tissue. Bier has acted upon this theory by injecting blood between the fragments in cases of delayed union. Hence Kônig insists that the wound should not be cleaned out too zealously during an operation, and by carrying out this idea he has obtained unusually good results.

OPERATIVE TECHNIQUE

Every precaution must be taken to avoid infection, which is an ever-present and serious danger. In order to harden and disinfect the skin, it is my custom, in addition to the usual procedures, to apply over night a compress wet with a 1-per-cent solution of formalin. Gloves should always be worn, as well as coverings for the hair and mouth. The gloves should be heavy, in order to lessen the risk of tearing them upon sharp points of bone.

It is important that the incision should be long, in order to facilitate and thus lessen the necessary manipulations. If possible, the ends of the bones should not be turned out of the wound or denuded of periosteum. Clots of blood and other *debris* must not be uselessly disturbed in clean cases, which means the avoidance of irrigation. Some advise the exclusive use of instruments in the wound instead of the fingers, but this is surely unnecessary when the hands are properly gloved.

In most oblique fractures, and in some transverse ones it is necessary to fasten the fragments together in some way; but when this can be avoided with security by fitting the jagged ends of the bones into each other, it should always be done; because a foreign body adds to the dangers of sepsis and delayed union. Bronze-aluminum wire is the best material for the purpose. Silver wire breaks too easily when twisted, while chromic catgut and silk give too little stability. Plates, screws, staples and clamps are seldom required in recent fractures, although so often indispensible in cases of non-union. When it is desirable, however, to use something more secure than a wire, a properly constructed clamp is better than the other appliances, because it is firmer and does not necessitate the re-opening of the wound to permit of its removal. My own clamp is simple and effective. It consists of four long screws inserted deeply into the bone, two on either side of the break, and clamped together outside the skin by two metal strips lined with soft wood (see illustrations). The screws imbed themselves in the wood at any angle which they may happen to assume, requiring only moderate care in their adjustment. (See Figs. 1 and 2).

The skin-wound is united by sutures around and between the projecting screws, leaving merely the holes for their passage. Much experience, by Parkhill, myself and others, has shown that infection rarely occurs when the operation is a clean one, and then it appears so late that it confines itself strictly to the screw-holes and does not invade the already walled-off area of the fracture. I have left such a clamp in place as long as eight weeks with only the most trivial infection.

In long, oblique fractures it may be desirable to twist a wire entirely around both fragments, but usually it is necessary to drill holes in the bone. These should not extend clear through, but should penetrate obliquely from the surface on one side of the break into the medullary cavity and out in a similar manner on the other side so as to necessitate as little manipulation of the fragments as possible.

Unless there is reason to anticipate infection, which is especially the case in compound fractures, the wire should be buried without provision for its subsequent removal; otherwise the ends may be left projecting through the wound. Complicated splints or tight bandages are seldom necessary, as there can be but little tendency to displacement after operation. An apparently trivial, but rather important point, is the use of common cotton batting in the dressings; because of its comparative impermeability to discharges from the wound, thus rendering infection less likely and disturbance of the part by the changing of dressings unnecessary. For similar reasons, the splints should be covered with sterile oiled silk.

Cautious massage and passive motion should be instituted as soon as possible, sometimes within a few days, this being one of the advantages of a secure union of the bones by operative means.

There has been much discussion regarding the proper time to operate upon recent fractures; whether it should be done at once or after a certain interval — say from 7 to 14 days. The advocates of delay claim that it is advantageous to wait until absorption has removed the grosser results of the injury, believing that the operation will then be easier and less dangerous. This reasoning seems, however, to be fallacious. It is probably better to operate as soon as possible, because the likelihood of infection is no greater, and the longer the delay the more the tissues contract and the harder it is to set the bones.

In this connection it is interesting to note that the chief impediment to the reduction of fractures in general is the shortening of the tisues; due at first to extravasation of blood and to exudative swelling, and later to permanent shrinkage of the parts occurring during the process of repair. When this shrinkage has once taken place, it is difficult and often impossible to stretch the shortened tissues back to their original length, thus necessitating resection of the ends of the fragments of bone at the expense of increased operative risk.

During the last few years I have operated upon 33 cases of recent fractures, excluding those of the skull, spine, jaw, and patella. The operations were distributed as follows:

Shaft of humerus	2
Lower end of humerus	7
Upper end of humerus	1
Shaft of femur	4

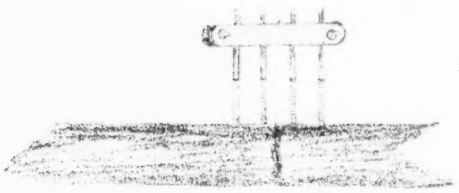

Fig. 1. Showing screws inserted and clamps in place.

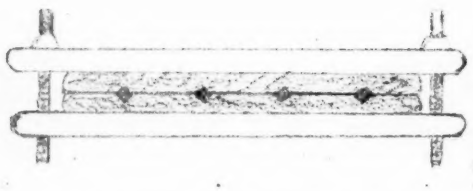

Fig. 2. Cross-section of boards holding screws in position.

Lower end of femur	1
Tibia	10
Head of radius	1
Bones of forearm	3
Bones of fingers	1
Clavicle	3

Ten of these fractures were compound (tibia 7, forearm 2, finger 1) and 23 simple. Among the simple fractures there was but one slight infection, which necessitated the removal of a wire. Among the compound injuries were a number of more or less serious septic difficulties, depending directly upon the contamination of the original wound.

There were 9 cases of delayed union, all of them finally giving good results except 2 which ended in pseudo-arthrosis. All of these delayed unions were in the shafts of the bones and none in the epiphyses, a point worthy of attention. Six were in connection with compound and 1 with simple fracture of the tibia. One in simple fracture of the bones of the forearm and in simple fracture of the femur. Wires were employed in 6, a clamp in 1, and 2 were merely adjusted without fixation.

In attempting to draw conclusions from these cases of delayed union, allowance must be made for the fact that this difficulty may arise when no operation is done. It must likewise be recognized that the wire suture is not always at fault, because delay in union is also observed when the fragments have been adjusted without wiring.

I desire to call especial attention to the necessity for operation in fractures of the humerus just above the elbow joint, which notoriously give such bad results from ordinary methods of treatment. In fact, the satisfactory adjustment of this injury by means of splints is admitted by many authorities to be more or less a matter of chance, owing to the swelling of the part, the shortness of the lower fragment and the difficulty of adequately controlling it. The result often is that the sharp end of the upper fragment projects downwards and forwards in such a manner as to interfere with the joint, while the callus surrounding the misplaced bones may be so great as to contribute essentially to the anchylosis.

In these cases adjustment can usually be quite easily and safely accomplished through an external incision. Wiring or nailing is generally unnecessary; because the rough ends of the bones can be fitted into each other with sufficient security, especially if the particular angle of flexion of the elbow which is most advantageous for the purpose be observed while a finger is still in the wound, which maneuver I consider to be an important feature in operating.

I have operated upon 7 of these cases which under control of the X-ray I could not adjust otherwise, the final results being surprisingly satisfactory in every instance.

The surgery of the elbow has now reached a point where it can be said that every fracture should be operated upon when satisfactory replacement of the fragments, as shown by the X-ray, cannot otherwise be accomplished. This applies not only to transverse fractures of the humeral epiphysis, but also to separation of the condyles and breaks of the head of the radius, the coronoid process and the olecranon process. It may sometimes be advisable to merely adjust the fragments, while in other instances wiring, nailing, or even complete removal of pieces of bone, lying loose in the joint may be required.

TENOSYNOVITIS OF THE HAND

A Clinical, Experimental, and Anatomical Study

By ALLEN B. KANAVEL, M. D., Chicago, Illinois
Assistant Professor of Surgery, Northwestern University; Professor of Surgery, Post-Graduate Medical School

(*Continued from the January number.*)

TREATMENT

Before discussing my own views as to the site and course of the incision for the various fingers when the diagnosis of tenosynovitis has been made, let us study the views of those who have previously made contributions to this subject.

Professor Bier (Berlin) with his assistants, has been an active advocate of the production of passive hyperæmia in these cases of infection of the hand. His method consists in applying a constrictor to the arm so as to produce a moderate passive hyperæmia without causing pain and without restricting the arterial flow of blood. The constrictor should be a broad band and to prevent pain should extend from two to four inches up and down the arm. It should be so applied that the full amount of œdema does not appear at once but accumulates gradually for from three to four hours. The constrictor is left on from sixteen to twenty-four hours. After an interval of from two to four hours it is re-applied. Small incisions are made into the tendon sheaths or other sites of pus.

Klapp has added to this by suggesting the use of suction cups, these being applied so as to produce moderate hyperæmia without pain. Cups from which the air can be exhausted are used over localized accumulations of pus. Long glasses which have rubbers at the end and can be applied over the finger, as shown by the illustrations, have also been devised. In involvement of the connective-tissue spaces, it is my personal opinion that these appliances may be of slight value. In other conditions, however, I believe the benefit to be derived is so slight as to hardly justify their use. Many German surgeons have maintained that Bier's methods are of value in tendon-sheath infections, but personally I have never been able to secure good results with them, except possibly in a few cases where there has been a sinus, leading down to a tendon sheath. The sinus seemed to close more rapidly under the suction cup of Klapp than by any other means.

In order to prevent rapid absorption of toxins it is my habit to leave on an Esmarch constrictor for from twelve to twenty-four hours after operation, except that the constrictor is loosened to produce only a slight hyperæmia. I cannot but feel that while slight benefit may occur in come cases, the so-called Bier treatment of infections of the hand cannot be looked upon as a marked aid.

EXCERPTS FROM THE LITERATURE

Klapp and other surgeons have discussed the Bier method of treatment in these cases at the German Surgical Congress.[1]

Klapp has begun to make free incisions in the tendon sheaths at the lateral surface of the fingers and cut the ulnar bursa throughout its length with the exception of the anterior annular ligament, using alcohol dressings, and active movements the first day. His results have apparently been as satisfactory as those obtained by Bier and Klapp previously where they made small incisions into the tendon sheaths and applied the Bier constrictor. By this method he has treated nineteen cases.

1. 10 cases of pure tendon-sheath infection; 9 healed with 1 necrosis.

2. 2 cases of subcutaneous abscess under the tendon with necrosis of the skin; 1 healed and 1 recovered completely.

3. 6 cases of tendon-sheath infection complicated with infected phalangeal fractures; 2 of these healed and 4 became necrotic.

4. 1 case developed sepsis and died on the twelfth day.

Klapp therefore concludes that he has thus answered the question as to whether Bier's good results came from hyperæmia or from the physiological treatment. He maintains that he

[1] Berliner klinische Wochenschr., April 13, 1908, No. 15.

has proved that it came from the latter. He now proposes to study whether good opening, physiological treatment, and Bier's hyperæmia will not produce still better results.

Klapp's paper was discussed by Joseph who suggested that there are two types of the infection which must be differentiated, (1) where it is localized to the sheath, not showing a tendency to spread; (2) a type which shows a tendency to spread beyond, due to the great virulence of the infection.

He maintained that we should use care not to go beyond the zone of protection which Nature has thrown out to wall off the infection whether it be within the sheath or without. In these cases we should use the smallest possible incisions and Bier's hyperæmia.

Kausch stated that he had treated a large number of tendon-sheath infections after Bier's method and must say that he was generally well satisfied with the result. He has not been so well satisfied with the very severe cases. In the beginning he used small incisions, then medium size and drained with passive hyperæmia, but in his severe cases he has now gone back to large incisions, although not as large as formerly.

Karewski stated he could not attribute his bad results to the Bier method but rather to the fact that his material was ambulatory and could not be correctly handled. He had used the older method for twenty-five years. He now makes a moderate sized incision, packs lightly, and keeps the arm at rest as long as there is fever. Of fifty-seven cases, four had to have amputation of the fingers at once. Of the fifty-three cases remaining, nine were treated by lateral incisions. Of the fifty-three cases, forty-two showed good results, that is 70.25%; bad results, 5 cases or 0.5%. This result is better than that given by Dr. Klapp.

Forssell, in his excellent monograph previously referred to has collected the opinions of various surgeons and I shall quote and abstract extensively from him. He gives the results of his own experience as follows:[1]

"Even if one makes smaller incisions into the sheath, at least according to the experience met with in the Seraphimer-Lazarett, one rarely succeeds in saving the sheath (Poulsen's experience was the opposite). I have often attempted to treat such an infection with incision at each end of the tendon sheath and with complete exposure of the surrounding folds of the synovialis (and subsequent washing of the sheath with water, normal salt solution, boracic acid solution, iodoform-glycerine, weak carbolic, or sublimate solutions), but only on three occasions was this treatment successful.

"The treatment which in my judgment, should be used in most cases, is a complete splitting of the sheath from one end to the other. Thus one often succeeds in saving at least the inner tendon from complete necrosis.

[1] Nordisches Med. Archiv., 1903, abt. i, heft 3.

"For the opening of the ulnar sheath on the forearm, if for this or that reason one prefers to begin the incision here, several starting points are at his command. If one can determine the ulnar pulse, the skin incision is made one centimeter to the radial side thereof, and after cutting through the fascia meets the collected muscular bundle of flexors of the fingers at whose ulnar and posterior circumference the sheath extends farthest upwards; by passive movement of the ulnar finger it is now a simple matter to know the lay of the land. If one does not feel the ulnar pulse, nor the os pisiforme, which lies close to the ulnar side of the ulnar artery, nor the unciform, on whose radial boundary the incision must fall, one can make the skin incision on the border of the middle and inner third of the wrist joint and then dissect layer for layer down to the tendon sheath.

"If it is a case of inflammation of the ulnar sheath of the palm, and the tendon sheath of the little finger, it is often preferable to begin with the fissure of the latter. Only in exceptional cases it might be worth while to use a more conservative treatment, and that especially in such cases of fresh tendovaginitis where this is secondary after an ulnar bursitis; in such cases one can occasionally make an attempt to conquer the inflammatory process by washing out the tendon sheath through incisions made in either end; there is little danger in this method, and if successful, it insures complete movability of the little finger.

"The skin incision must then be laid from the upper end of the opened little finger sheath, up towards the hook of the unciform (i. e., must follow the radial boundary of the hypothenar) and then continued in the length of the forearm to a point three or four cm. or more above the wrist. After cutting through the skin and the subcutaneous fat, usually especially developed here, the palmar aponeurosis, the strong anterior annular ligament and the forearm fascia are cleft, the superficial vessels cut through and ligated (the ligatures being left long because the vessels usually drawback deep into the tissue and with their infected ligatures give rise to collections of pus which might easily be overlooked), after which the sheath is opened. Even when the infection is confined to the tendon sheath, the incision should be continued in the skin and soft parts until it gives a good opening into the sheath, through which this can be easily and completely packed with gauze.

"In continuing the incision, it must not be allowed to deviate too far to the ulnar side as the ulnar nerve and artery might thus be injured; the cut can and should be so laid that neither of them is exposed. The anterior annular ligament is best cleft some distance from the hook of the unciform.

"If, however, it is a question of suppuration of the radial bursa, I believe that a complete fissure of the anterior wall of the bursa should not be attempted. If the incision is made in the early stages of the infection, one may have the satisfaction of seeing the tendon of the thumb saved and the infection restricted; the tendon, cannot, however, be saved in all these

cases and sometimes, moreover, it is rendered useless by adhesions to neighboring regions. An incision in this direction is to be regarded as even more than useless, when it is attempted in more advanced cases, where there is no chance of saving the tendon; to stop a suppuration, which is supported by a necrotic tendon, one does not confine himself to a removal of this tendon, but undertakes an operation which lames an important group of the muscles and so makes the thumb practically useless.

"How then should one proceed in suppurations of this order, as I believe there are three ways at our command?

"1. Incision in the radial bursa above and below the lig. carpi sparing the above mentioned nerve of the thenar. The first mention of this method, which I have found in the literature, I found in an article by Nicaise (Gazette médicale de Paris, 1870, s. 615) who, however, opens only the tendon sheath of the thumb under the carpal ligament and not the radial bursa; the case ended in necrosis of the distal part of the tendons. Surely then, if a decided improvement has not been shown within the first twenty-four hours, one should proceed more radically, in which case the choice is between the two following methods.

"2. Incision as in 1 and excision of the long flexor tendon of the thumb. Through removal of the tendon, which is usually the principal reason for persistent suppuration, one also gains a lessened pressure in the radial bursa and better drainage with less danger of a spreading of the inflammation. Primary excision of the tendon is to be considered: 1, when the tendon is already necrotic, or its continuity broken, or if it is so injured that its restitution seems hopeless; 2, if the synovialis is infiltrated with pus and necrotic; 3, in case of inflammation of the joint or fracture of the thumb whereby the functions of either the interphalangeal joint or of the tendon are completely interrupted; 4, in people of age or poor general condition.

"3. A more or less complete fissure of the lig. carpi beginning at the upper edge is added to the above-mentioned incisions. Complete fissure of the lig. carpi can be carried out without any direct injury to the motor medianus branch to the thenar muscles; nevertheless, this nerve branch in case of an infection of the edges of the wound might possibly be exposed to the dangers of necrosis."

I am in receipt of a letter from Dr. Forssell under date of September 10, 1908, in which he reiterates his belief in free incision. It is abbreviated as follows:

"With regard to your query, whether I have modified my opinion of the complete splitting of the tendon sheath from the end of the finger up into the forearm, I must answer that I still adhere to it with the exception mentioned on pages 37 and 63 of my paper, i. e., I still make sometimes, endeavors with smaller incisions and spraying through the tendon sheaths of the thumb and little finger when a tendon sheath has there given rise to an infection of the radial or ulnar bursa and split the tendon sheath of the finger only when the smaller incisions do not lead to the desired results.

"Prof. Bier's hyperæmic treatment has been used by me for a few cases of infection but without any appreciable benefit, this being also my experience with cases of tendon-sheath infection. The material at my disposal may, however, have been too slight for my forming an opinion of my own concerning the value of the Bier method for tendon-sheath infections. At the surgical department of the Karolinska Institute (The Royal Seraphim Hospital) where I worked out my paper and where the principles I advocated gained general approbation, and caused a considerable improvement in the results obtained, there was later on a good deal of enthusiasm felt for the method invented by Bier; but I was told that some time ago the method was discontinued since it had given several very unfavorable running cases, and in the main the former old method of treatment has been again taken up.

"Whatever method may be used I feel sure that fatal cases will have to be deplored. As the prophylaxis therefore is invariably of the very greatest importance I have lately come to the conclusion that one way of trying to prevent infections of the fingers from attacking the tendon sheaths is by previously exposing the tendon and tamponing it around, to the extent of a couple of centimeters. This proceeding should be of special use in necrosis of the end phalange of the thumb that so often occurs and which greatly endangers the tendon sheath of the thumb being infected, and thus also the bursa of the hand.

"The method has been proved by me as yet in but one single case, though with success. I then proceeded as follows: The tendon sheath of the thumb was split to the extent of a couple of centimeters, the tendon was cut near its attachment on the end phalange, and was fixed by a suture in the vicinity to its surroundings, a tampon being placed around. After this the necrotic end phalange, with the tendon attachment was removed.

"Seeing what interest you feel for the infections of the hand in general, I must call your attention to the small contribution I have given in pages 32 and 33 of my paper. So far as I am aware the isolated necrosis of the fascia palmaris has not previously been mentioned in literature, which is singular since both from a diagnostic and therapeutic point of view it is of great interest. I have recently had a similar case under treatment. An English sailor a fortnight previous to being admitted to the hospital had stuck a hole in his hand with a nail. Besides the mark of the injury there was great soreness in the palm, accompanied by considerable swelling of both palm and back of the hand, with a very observable crooking of the fingers together with pain when moved, but no tenderness when the fingers themselves were subjected to palpation. The diagnosis was made for the probability of an abscess in or around one of the aforesaid fascia, which was found to be necrotic in the greater part of its extension, this without any appreciable accumulation of matter in the vicinity. It would be interesting to hear whether

you have had any occasion of observing a case of this localizing of the infection."

W. Heineke, in his "Anatomie und Pathologie der Schleimbeutel und Sehnenscheiden," Erlangen, 1868, p. 79, speaks of the acute inflammations of the tendon sheaths of the hand:

"The only cure in these malignant inflammations is to be found in an early and extensive incision; thus one can sometimes prevent a necrosis of the tendon, but one must not expect too much in this direction. After cutting several openings, one can, by use of the drain, help the outflow of pus and the cleaning of the wound."

An article by Scheide[1] shows what a lack of even elemental knowledge there has been in the past in regard to the position of the pus in these cases. He warns against hot cataplasm treatment of these diseases and recommends that introduced by Volkmann, the so-called vertical suspension of the arm together with continuous ice applications, and even painting with iodine.

"In very great swellings, and excessive overfilling of the veins, numerous stabs with a very sharp knife often do good service. When the period of progressive inflammation has passed and with it the danger of death, when the healing has begun, then the question will again be what operations are necessary. Many a necrotic phalanx, many a finger whose tendon sheath has become purulent, will have to be removed; and now another question becomes of primary importance, the greatest possible functional activity of the remaining parts.

"This latter is most frequently hindered through the necessary fixation of the hand for weeks and months thus causing the fingers to lose a great part of their power of motion. The well-known changes to which joints are subject when kept stiff for a long while, seem to take place especially quickly in these small joints under the influence of rest and the inflammation of the surrounding tissue. One distinctly feels then how in bending pseudo-ligaments snap or the capsule tears. With the necessary patience and endurance one can master these disturbances without a doubt. But a great deal of trouble to the physician and pain to the patient would be avoided, if immediately after the first period of reaction simple passive exercises were given whenever the dressing was changed, and so prevent any severe stiffening of the joint."

Schüller[2] shows the same lack of anatomical knowledge. His remarks are typical in that they show a lack of tendency to make an early diagnosis. His drainage under the anterior annular ligament should also be condemned. The same may be said concerning the remarks of Tilleaux which follow.

"If after a tendonal panaritium of the thumb, a doughy swelling along the arterio radialis of the forearm is noticeable, pressure there and on either side of lig. carpi volare is very painful, while the fingers are crooked, it is advisable to make a few incisions immediately, if possible, along the line of the flexor longus pollicis into the tendon sheath as far as the muscle, in order to prevent further changes, especially the occurrence of pyæmia or septicæmia. The incisions are made to the best advantage on the forearm outwards (radially) from the a. radialis and along it. In some cases this is sufficient, as evidently the whole of the great tendon sheath is not always affected from the very beginning, but only its radial half. In other cases, further incisions in the great tendon sheath, in the ulnar side, are necessary. Here an incision is made to the best advantage close above the anterior annular ligament and at that, not exactly in the center, but to avoid injurying the median, more towards the ulnar side and in the direction of the long axis of the forearm. That one should put drains in all incisions (best under the lig. carpi volare), wash out the pockets with an antiseptic fluid, and bandage the wound antiseptically, I will only mention in passing. Sometimes even these incisions are not sufficient; then one must add similar ones in the palm and in the forearm."

P. Tilleaux[3] speaks of the so-called subaponeurotic abscess:

"One must hasten to make two incisions, one in the palm of the hand, the other in the forearm, connecting them by a drainage tube which passes behind the anterior annular ligament of the wrist."

Concerning operation when a diagnosis of extension into the forearm is made he continues as follows:[4]

"It is now well to delay no longer in opening the focus extensively without waiting for the fluctuation to become more superficial. In reaching the skin the pus must invade the lower layers of the forearm and also the radiocarpal articulation.

"In making this opening one must cut through the entire thickness of the anti-brachial region and 'manage' the important organs there enclosed, especially the median nerve. Remember that this nerve is placed slightly without the axis of the forearm; consequently the place to choose for the opening of deep abscesses of the wrist joint is located just inside the median line.

"At this level make an incision about 4–5 cm. long and successively, layer for layer as if for a ligature of the artery, cut through all the soft parts of the forearm until you reach the focus.

[1] Ueber Hand und Fingerverletzungen. Volkmanns Sammlung klinischer Vortraege. 1871, N. 29, note 1.

[2] Chirurgisch-Anatomische Studien über die Sehnenscheiden der Hand. Deutsche med. Wochenschrift, 1878.

[3] Traité d'anatomie topographique, 1887, p. 572.

[4] Traité de chir. clinique, 1897, tome i, p. 674.

"If in the hand there be a focus communicating with that of the wrist below the anterior annular ligament of the wrist, it would be necessary to drain it, and it might be even to make another opening."

Further on on pages 684, 685, he not only continues to show a lack of knowledge of the anatomical and pathological condition present, but advises procedures which should be condemned.

"Sub-aponeurotic abscess. The abscess must be opened from the palmar face always remembering that the superficial palmar arch lies in a transverse line, beginning at the root of the thumb. One should, at the same time, open the abscess from the dorsal side and establish thorough drainage.

"If necessary, pass another drain joining the hand and wrist through the radiocarpal canal. Long carbolic baths should be given."

Koenig [1] speaks for early and large incisions, strong antiseptics (5 per cent carbolic acid), drainage, suitable position of the hand and finger inside the bandage, vertical suspension of the arm, excision of the necrotic tendon, but only after a true loosening has taken place.

"But even when the tendovaginitis has persisted for a long time, if the abscesses have formed along the forearm with suppuration, much may be accomplished with antiseptic treatment. Here too, it is a question, after one or two days of suspension to stop the swelling, of extensive opening of the abscesses and drainage, to introduce a number of small pieces of a drain into the abscess openings. Then all the abscesses are disinfected in the manner described above and an antiseptic bandage applied (iodoform). If one succeeds in this wise in mastering the progress of the disease, then usually permanent irrigation with salicylic acid will work admirably.

"Large, widespread incisions are to be recommended under such circumstances and one should not hesitate to do as Helferich has already suggested, under special conditions to cut through the transverse ligament. Helferich recommended that after so extensive an incision the ligament and the wound should soon be closed with a secondary suture, if the phlegmon is receding."

The use of strong antiseptics, particularly 5 per cent carbolic acid as suggested by Koenig, has been almost entirely abandoned. It is recognized now that these antiseptics certainly impair the physiological function of the cells and probably do as much harm as good.

E. Lexer,[2] says:

"Good results may be obtained only by as early and as long an incision as possible."

[1] Speciale Chirurgie, vol. iii, pp. 369, 370.

[2] Speciale Chirurgie, 1902, s. 726.

B. Tillmans,[3] says:

"In light cases one treats an acute non-suppurative carpal bursitis by a high vertical position on a splint, and ice. If improvement does not follow, if suppuration threatens or if it has already started, one should open the synovial sac by extensive incisions above and below the anterior annular ligament, drain it and apply an aseptic bandage, preferably with a higher vertical position on the suspension splint according to v. Volkmann. Strict precautions should be taken against an extension of the suppuration, for example to the forearm."

P. L. Friedrich [4] expresses himself as follows:

"If the inflammatory process finally extends upwards even under the carpal ligament and in the manner just described reaches the subfascial musuclar interstices of the arm, the only advice one can give is to go down with knife and dressing forceps into each suspected focus of infection, with careful consideration of the nerves and vessels, and to drain effectually with a not too thin drainage material which will not be pasted together by taut portions of tissue. If it is not possible to guarantee the outflow of the pus in a short time to such an extent in the region of the transverse ligament, consideration of the danger to the carpal joint demands the cutting of the transverse ligament. (Helferich, Koenig.)"

Friedrich's article demonstrates that even at the present time there is a tendency to blind dissection in these cases. The same may be said of the articles appearing in the later systems of surgery emanating from American authors.

P. Mauclaire [5] in a similar French system of surgery (we find a very similar description by Lyot), gives the following description of treatment:

"As for the sub-aponeurotic abscess, if it is a question of deep lymphangitis, or of suppurative synovitis, the incision should be made where there is fluctuation, and the region drained, it being possible for the same drain to go from the palmar region to the antibrachial region. In making this incision one should guard the blood vessels, the nerves, and the tendons. One often finds a focus of suppuration in the forearm, in the median line in front of the pronator quadratus or sometimes between this muscle and the interosseous membrane.

"To open this focus, one should make an incision either on the center of the anterior face of the wrist along the inner edge of the palmaris longus, or longitudinally along the internal border of the wrist; by approximately following the anterior face of the ulna, one

[3] Vehrbuch der speciallen Chirurgie, 1901.

[4] v. Bergmann, v. Bruns, V. Mikulicz, Handbuch der praktischen Chirurgie, 1901, vol. iv, p. 420.

[5] Dentu et Delbert, Traité de chirurgie, 1901, tome x and tome ii p. 850.

makes a path between the deep flexor and the pronator quadratus. (Parona.)"

F. Lejars [1] gives the following advice for the treatment of deep phlegmon of the hand:

"One must open the palm, the great palmar sheath, then above the wrist, incise the superior extension, the antibrachial cul-de-sac of the abscess; and last from one opening to the other pass a drain. An operation indeed, a difficult operation in such a position, yet an operation of immediate urgency, if one wants to save this hand. This done, place the member in a continuous bath, leave it for hours in the liquid which one renews from time to time, to keep the temperature the same. This will be the best after-treatment of the operation which you have just made."

Lejars' is a procedure which can be carried too far, since the development of granulation tissue may be excessive and in my opinion the treatment should be abandoned after twenty-four or forty-eight hours when the process is found to have come to a standstill. After that the hot bath may be used at the time of dressing only.

In a treatise on the treatment of serious phlegmons, delivered in the Naturforscher-versammlung in Halle,[2] 1891, Helferich of Griefswald explains his methods as follows: As example he takes a phlegmon of the hand and forearm, resulting from a penetrating injury to the little finger, and emphasizes that such a case as well as a crushed fracture, should be opened as quickly as possible to prevent the spreading and further resorption of the poisonous matter and the inflammatory disturbances of tendons and connective tissue.

After the usual preparations for the operation, (bath, deep narcosis, cleaning of the operative field, application of Esmarch's bandage) he makes an extensive incision at the point of infection, that is, for example, on the little finger, which runs to the side of the flexor tendon longitudinally. An assistant carefully draws apart the edges of the wound which are at first only slightly gaping, with two little hooks. If the suppurative channel is opened either beside or within the tendon sheath, the careful introduction of a sound serves to control the direction of knife and scissors. And so, the preparations having been made, one continues the incision farther into the palm of the hand, sparing only the tendons, nerves, and large vessels, through the anterior annular ligament over the volar side of the forearm. Here in case of a phlegmon extending from the little finger, one keeps to the ulnar side of the common flexors, continuing upward, the region having been prepared before. If it is a question of a phlegmon on the thumb side of the hand and the radial side of the forearm, one would proceed accordingly but following the same principles. The object is complete exposure of the suppurative foci, and the prevention of the infiltration of pus into the intermuscular layers of connective tissue. Often enough a focus somewhat encapsulated by the sticking together of the edges is found between the muscles and even under the flexor profundus digitorum, so that the interosseous membrane is widely laid open. Upwards the incision first comes to an end when a thorough examination of the tissue and the palpation of the adjoining region leads one to expect healthy conditions.

"As far as necessary, other incisions are added to this large one, either on the other side of the palm or on the dorsal side."

He is decidedly against any other treatment of this process and has never seen any good results from small punctures; small incisions and drainage cannot effect nearly as much. Disinfection of the wound is dispensed with and he confines himself to a careful washing out with a 6 per cent salt solution, emphasizing the local injurious, irritating effect of antiseptics and the very unfavorable effect of the same on the kidneys.

In the after treatment he emphasizes passive movements, baths, active movements in water baths, massage, electricity, occasional compression, and nightly fixation in various positions.

Helferich then recommends an apparatus invented by Dr. Krukenberg for the development of passive movements.

C. L. Schleich [3] says in speaking of the treatment of phlegmons of the palm of the hand:

"If we cut through the ligament we can prepare for the most serious functional disturbances; if on the other hand we do not follow up the channel of suppuration we leave a great mortal danger. To decide this matter, we press firmly on the tendinous convolutions above the ligament of the forearm and pressing out the contents toward the periphery; we will suppose that no drop of pus flows from the tendon pocket below the ligament. We are not then obliged to make a counter opening above the ligament, which would have been absolutely necessary in the presence of pus above the same. I depend on the appearance of this superligamentary flexor swelling to decide whether, through a counter opening I shall pass a drain of gauze strip under the ligament, or whether I shall cut through the ligament to further lay bare the avenues of infection. In case of dry opacity and scarring, I usually let gauze drainage suffice; if, however, fluid pus is found between the tendons, I stand for unconditional severing of the ligament and further following up of the avenues of infection."

K. Poulsen (quoted from Forssell) gives the following description of the opening of the ulnar tendon sheaths:

"If the sheath is swollen, or the skin œdematous, it is not so easy to see what one is about or to say exactly

[1] Traité de chirurgie d'urgence. Paris. 1901.

[2] Berliner klinischen Wochenschrift, 1892, N. 4.

[3] Neue Methoden der Wundheilung, Berlin, 1899.

what flexor tendon lies before him while he is making the incision; yet in these cases it is of no great importance if one should happen to get in between the deep flexor tendons of the second and third fingers; the sheath when it is stretched is always opened, if one only gets in between the tendons of the deep flexor muscles. The incision is then made in the following manner: the arm is rendered bloodless and then one determines the position of the m. flexor ulnaris with the help of the os pisiforme, its point of insertion, and of the tendon of the m. flexor carpi radialis by drawing a line upwards from the second metacarpal joint to whose base it is attached. Half way between these two tendons an incision is made to the lig. carpi volare proper; hooks are used to widen the wound, with the radial (side) one must be very careful on account of the median nerve. Next he proceeds into the depth between the tendons, first the superficial ones, then the deep-lying ones; when the connective tissue which binds together the deep tendons has been passed, the sheath is opened, the pus streams out, with a Lister's forceps the opening of the sac is dilated upwards and downwards; after this iodoform gauze is laid in, the bandage removed, and the bleeding stopped by compression.

"As a bandage I usually use a boric acid application, which is changed daily while the gauze remains undisturbed until it loosens of itself; as a support for the hand a volar-splint is used. Some prefer to make an opening upon a bulb-headed probe previously introduced in the vola manus on the lower border of the lig. carpi volare proper, and to draw a drain in between the two openings. Yet I must say that I have no particular fondness for using drains in this place, as they easily compress the tendons in this comparatively narrow canal and thereby give rise to necrosis. If the incision has been made above the ligament, and along the tendon to the little finger, there will be an upper and a lower opening of the bursa, which, without danger to the tendons, can be held open by gauze drainage which offers sufficient outlet for the pus, at least as long as the pus confines itself to the sheath alone. If the suppuration lasts I prefer to split the ligamentum carpi volare proper and lay open the canals; it is not rare to succeed in this way in rescuing the tendons, which at this point have a fairly large vessel lying in mesotendon."

K. Poulsen has also discussed the therapeutics of tendovaginitis of the thumb and radial bursa. He opens the finger tendon sheath to the lower edge of the m. abductor pollicis and the radial bursa above the ligament, avoids drainage tubes, and in their place uses gauze drainage.

"In cases of persistent suppuration the ligament is cleft and a peritendinous phlegmon is mastered by continuing the incision on the thumb along the lower border of the m. abductor, and laying in drains when it is seen that the tendon will be lost; the cutting through of the muscular system of the thenar, used by some, should be resorted to only in desperate cases, because it destroys in large measure the function of the abductor."

It would seem from this that Poulsen, at least in coincident infections of the tendon sheath of the thumb and the radial bursa, opens the latter only above the ligament, and to expose that part of the bursa which lies within the thenar, only when the suppuration has spread beyond the bursa. In cases of persistent suppuration the ligament is cleft; but he does not state whether, after this tardy fissure of the ligament, he has found the flexor tendon of the thumb and the thenar nerves capable of carrying on their work or not.

"Why it should ever be necessary to split the thenar muscles after cleaving the ligament, I cannot see, as only a small upper point covers the radial bursa below the ligament. Nor is it clear, why such a fissure of the muscles in question should destroy a great part of their functional activity; but the incision, continued through the ligament and all the soft parts including the tendon sheath, cuts through the nerves, not only of the m. abductor, but also of the m. opponens and of the superficial part of the m. flexor brevis, and thus causes a very troublesome crippling of the thumb.

"Finally, to use this method of operation in 'desperate' cases, will not rescue the tendon of the thumb; it is undoubtedly better to remove the tendon which in such a case would undoubtedly be spoilt or rendered useless at this late date."

To open the upper end of the radial bursa, Max Schüller proceeds as follows: "The incisions are best made outwards (toward the radial side) on the forearm, beginning at the radial artery and extending along it.

Nicaise, on the other hand, places the incision between the art. radialis and the tendon of the m. flexor carpi radialis, and between the latter and the tendon of the m. palmaris longus.

Treatment

This may be classified under three heads:

1. In the early hours while the diagnosis may be in doubt.
2. When the symptoms and signs of tenosynovitis are marked.
3. After-treatment.

Treatment while the diagnosis may be in doubt

Very commonly when a finger is infected, it is some days before the tendon sheath becomes involved; again, it may be early, and when it is invaded the symptoms develop rapidly because, as mentioned above, there is so little resistance that it spreads throughout the sheath in a short time. However, during the preliminary stage much may be done to prevent a spread into the sheath. The best sort of application is undoubtedly some form of

moist, hot dressing. Boric acid solution in saturated strength is most commonly used, but any of the other solutions in common use are probably just as efficient. Carbolic acid dressing in any form should be avoided because of the danger of gangrene. Local painting with ichthyol, iodine, and such virulent solutions is absolutely useless. German surgeons speak highly of 95 per cent alcohol dressings left on twenty-four hours. They probably are no more efficient than the hot boric solution and are always a source of some anxiety owing to the possible danger of their catching fire, as I have personal knowledge of in one case. Probably the next most essential procedure is to keep the part at rest; this, of course, is indicated in any infection since the muscular action tends to disseminate the germs, thus extending the area to be walled off by the leucocytes carried in by the dilatation of the vessels incident to the hot dressings. Elevation of the part is recommended by many, but personally I could never see any advantage in it except to make the arm comfortable and it is true the elevation of the hand is sometimes necessary for this. If the infection is severe put the patient in bed. An ice-bag in the axilla may help some. Keep the bowels open and the kidneys active. Preserve the nutrition of the patient. The methods of Bier and Klapp are discussed above.

TECHNIQUE OF TREATMENT AFTER DIAGNOSIS IS MADE

The diversity of opinions as to the proper methods of treatment held by various surgeons as noted above is sufficient proof of the severity of this condition and the difficulty of its treatment. It emphasizes the frequency of bad functional results, and should stimulate us to most careful study of our cases.

The diagnostic acumen of the operator cannot but be a vital factor in the treatment. It is probable that too many will err on the side of conservatism in the treatment of the first cases that are met. It will be reasoned that since some damage already will have occurred to the tendons if they are involved, a few hours' delay will not add seriously to the condition. This possibility will be preferred to that of opening and infecting an uninvolved sheath. However, these few hours are of great importance in the fulminating type and operation should be most prompt.

I do not intend this as advocacy of operation regardless of accurate diagnosis, but as a stimulus to careful study to the end that the surgeon being better qualified may neither, by ill-advised conservatism, delay necessary operation, nor by thoughtless audacious incisions jeopardize the usefulness of a healthy hand.

My own opinions as to the best methods are based upon my anatomical researches and upon observation of the patients presenting themselves at the dispensary and hospital of the Post-Graduate Medical School and Hospital, and the Northwestern University Medical School. To Professors Besley and Richter and others of my friends at these hospitals and at the Cook County Hospital, I wish to acknowledge my appreciation of the opportunity for the study of their cases in addition to my own. Concerning the technique of treatment I cannot help but feel that the future has much in store for us that we cannot know at the present time. The subject is one not only of local condition, but of the resistance of the individual, and his reaction to various toxines. In other words, the newer problems in serum pathology must first be worked out before we can attain the best results. I cannot help but feel, however, that even the local conditions are not so well understood by the average surgeon as is possible and that our bad results would be reduced at least by half, if more study were given to careful diagnosis.

I have secured the best results by the following procedures. Operation should always be done under general anæsthesia and in a blood-

Fig. 17. Lines showing the various sites for incisions in tendon sheath infections of the hand.

less field. Where the process is virulent and acute, I leave on the Esmarch bandage for twelve to eighteen hours after operation. Care is taken, however, to loosen it so as to produce a passive hyperæmia. In other words, I secure a Bier's hyperæmia for this time. This is done not so much for the therapeutic effect as to prevent the rapid absorption of virulent toxines. I hope in this manner to give the patient time to react and develop antitoxines to overcome the poison rather than allow him to be overwhelmed by a large amount of virulent toxine absorbed at one time.

TREATMENT OF TENOSYNOVITIS OF THE INDEX, MIDDLE, AND RING FINGERS

The procedure will vary according to the form of infection and the amount of destruction present. The first incision is made at the site of known infection opening the sheath at the side and not in the median line, cutting the length of the shaft of the proximal or middle phalanx, leaving the part over the articulation uncut so that the tendon does not prolapse. In those cases where it has seemed advisable to incise the length of the sheath, I have bound the finger out in an extended position to prevent prolapse of the tendons. After having opened the sheath at this one point, pressure upon its various parts will give one some idea of the extent of the invasion. If it is complete, as it generally is, a similar incision is made over the uncut proximal or middle phalanx. No incision is necessary as a rule over the distal phalanx and in making this I feel that Klapp is in error, if his drawing represents his technique correctly. Over the proximal end of the sheath at the base of the palm the technique will vary according to the extent of the invasion. If early, the incision is made over the middle of the sheath at its end in the palm, carrying it from the flexion

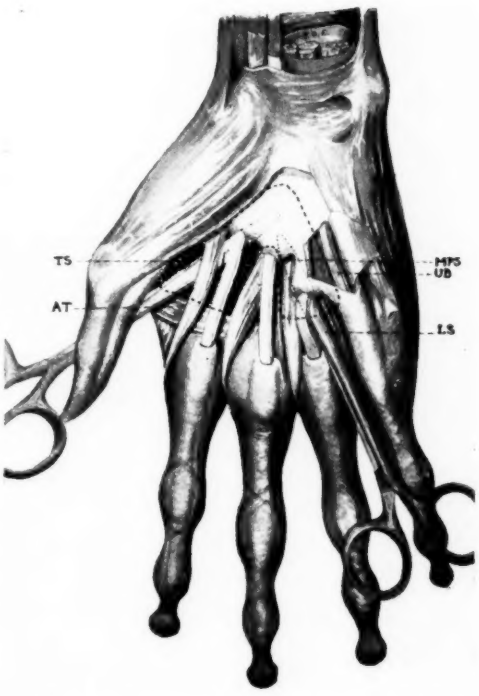

Fig. 19. Drawing made to represent the methods of drainage of the middle palmar space and of the thenar space. Artery forceps is thrust along the lumbrical canal (L S) for drainage in the middle palmar space. Artery forceps is thrust through the dorsum and across the flexor surface of the metacarpal bone of the index finger to drain the thenar space.

Fig. 18. Showing sites for incision in extension of infection to the dorsum. It will be noted that of the two incisions at the web, the one between the little finger and ring finger cuts the web completely, while in that made between the middle finger and ring finger, the web is preserved. This is to show the two types of incision. The third incision is made for drainage of the thenar space.

Fig. 20. Drawing showing the incision for draining lumbrical space and also an incision for draining the lumbrical space and the middle palmar space together when that is involved. For full description see the text.

crease at the base of the proximal phalanx for about three-fourths of an inch into the palm. If, however, there is some question whether the lumbrical spaces at the sides have begun to become involved, (v. s.) the incision is made upon the side most affected, opening the space and the tendon sheath at the same time. If both sides are involved two incisions are made. The finger is now cleansed and examined. If the amount of pus is great or the synovial surfaces are at all impaired, a second line of incisions is made upon the opposite side of the finger over the two proximal phalanges by inserting the knife blade through from the incision already made on the one side. (Fig. 17.)

I have tried cutting down to the sac in doubtful cases, then inserting an aspirating needle and attempting to draw off some pus for diagnostic purposes, hoping by this procedure to avoid the possibility of infecting an uninvolved sheath through opening it with a scalpel.[1] While theoretically the procedure would appear to be advisable, practically it is of little aid. The bulging of the sheath is generally easily seen while a failure to secure pus is not sufficient evidence of its absence.

[1] White, Whitlow and its treatment. Brit. Med. Jr., Feb. 24, 1906.

WHEN THE INVOLVEMENT OF ADJACENT AREAS HAS BEGUN

The involvement of the articulation between the middle and proximal phalanges has been discussed in the previous contributions. The method of treatment has been outlined there. I will only add to what I have already said that if early incision of the sheath is made this involvement is generally prevented, another reason for early incision. As has been pointed out, the paths of extension in the involvement of the lumbrical spaces vary in the individual fingers.

The index finger. When the infection passes to the lumbrical space on the outer side it may extend into the thenar space and the incision which opens the lumberical space can extend up into the thenar. Pressure upon the thenar area will force pus out along the line of incision. This is then extended along the radial side of the metacarpal bone, the incision lying dorsal to the web which extends from the thumb to the base of the index finger. The artery forceps is then carried across the palmar surface of metacarpal bone, and the blades opened thus draining the thenar space without an incision upon the palmar surface. (Figs. 18 and 19.) Care should be used not to force the point of the forceps beyond the middle metacarpal bone; otherwise the middle palmar space will be entered and an extension to this space favored.

When the extension has entered the lumbrical space between the index and middle fingers, the incision should be made into the sheath at its ulnar side, thus opening both the sheath and the lumbrical canal through the same skin incision. If the lumbrical canal is badly involved the pus may have extended distally into the loose mesh of tissue at the web or proximally. If distally it may be necessary to add a second incision upon the dorsum between the bases of the index and middle finger, and procure through-and-through drainage of the web, or at times I have split the web completely and have not as yet observed any serious impairment of function following. (Fig. 20.)

If it extends proximally, some care should be used in the incision since it may extend either into the thenar or middle palmar spaces. After the lumbrical canal is opened, pressure over these areas will demonstrate which is involved, since pus will exude into the incision. This is then extended upon a groove director along the line of invasion cutting about one-fourth of an inch proximal to the line joining the ends of the flexion creases at the distal part of the palm — an artery forceps thrust under the tendon into the space and the blades opened will effectually drain either. We frequently find invasion of the thenar area either directly from the sheath or secondarily by way of the lumbrical canals and when this occurs I frequently supplement this palmar incision by one upon the dorsal surface between the metacarpal bones of the thumb and index finger, i. e., drainage of the thenar space as described in an earlier contribution (see Figs. 18 and 19).

The middle finger. When extension occurs into the lumbrical canal upon the radial side or the web on either side, the technique of treatment is as has just been described. When the extension is along the lumbrical canal between the middle and ring fingers toward the palm, early the pus may be between the palmar fascia and the tendon in the "loft" as already described, but it very soon involves the middle palmar space. Here the incision is carried one-quarter inch into the palm, i. e., proximal to the transverse line joining the ends of the flexion creases. If pus is expressed through this from the palm, an artery forceps is inserted under the tendons going to the ulnar side and the blades opened. No drainage is inserted, although in a few instances I have placed in the pocket small strips of gutta-percha or gauze thoroughly impregnated with vaseline. Ordinary gauze acts simply as a plug and I never use it.

The ring finger. Here the extension to the web or into the palmar space from either side is treated by the same technique as described above.

TREATMENT OF TENOSYNOVITIS OF THE LITTLE FINGER AND ULNAR BURSA

The little finger. If the finger alone is involved, the treatment is the same as that noted above for the other fingers. We remember that there is a congenital separation in about half of the cases of the proximal from the distal portion at approximately the metacarpophalangeal articulation and in a certain proportion of these cases in which there is no separation the opening is so narrowed that there is a temporary dam produced by serous adhesions if the inflammation is not too fulminating in character, which unfortunately it generally is. In the former condition there is little likelihood of a spread to the ulnar sheath so that we should be extremely careful not to open this sheath unless we are certain that it has become infected, since we are exposing the patient to grave danger. On the other hand, if the occlusion is of temporary inflammatory origin we can readily see how important it is that an early diagnosis of the condition should be made and proper treatment of the distal portion instituted to prevent a spread to the ulnar sheath. Just what the proper procedure should be in case we are fairly certain that there is an infection of the distal portion of the sheath and we are still in doubt as to whether it has extended to the proximal or palm portion or not, there is room for discussion.

Forssell advises that we should begin at the point where we are least sure of infection, while Helferich suggests that we begin at the point of infection where we are sure and make our way along with care. Naturally, we would admit the former to be the proper method if certain unknown equations did not enter into the discussion. In the first place what proportion of aseptic ulnar sheaths can be opened and not infect the sheath from the lymphatics which are constanly carrying germs from the point of infection through the subcutaneous tissue in which our so-called aseptic incision is made? Upon the answer to this question depends in all probability the proper solution of the question and it will take a large number of carefully observed cases to arrive at a decision. Increasing experience, however, has confirmed me in the opinion that it is wiser to incise at a known point of involvement. This pocket being opened, pressure is exerted over the sites of predilection in continuity. If they are involved, pus will be seen to enter the

previously opened site. A groove director is now inserted along the canal and the incision continued or the focus opened by the proper methods.

When the continuation of this sheath in the hand is involved, the palmar portion is opened by an incision extending from the base of the finger at the distal flexion crease of the palm and passing toward the base of the palm. It is my custom to insert a groove director in the sheath at this point and follow along this cutting the tissues between the sheath and the surface, having the thought in mind to avoid the tendon and cut as far to the ulnar side of the sheath as possible, since it will drain better, particularly at the wrist, if this is done (see Fig. 7). Having arrived at the anterior annular ligament, pressure above over the prolongation of the sheath in the forearm will force pus downward into the sheath below the ligament if the infection has extended here, as it generally has. If it is very early in the course, it may be justifiable to leave the anterior annular ligament intact and incise the sheath above the ligament on the same line. This line here lies about one-half inch to the radial side of the ulnar artery. Generally, however, the swelling is such that the pulsation of this vessel cannot be felt. It is then necessary to proceed by choosing a point at the junction of the middle and ulnar thirds of the flexor surface and incising carefully, layer by layer, until the group of flexor tendons is reached. These can be identified by moving the fingers. The dissection is now carried down along the ulnar border of these tendons in juxtaposition to them and immediatey above the anterior annular ligament, since the sheath lies to the ulnar side and posterior to the tendons. If infected it should be freely opened, since the swelling due to œdema and inflammatory infiltration tends to close a small opening. If the infection is now seen to be at all severe, the anterior annular ligament is split as far to the ulnar side as possible. The hook of the unciform interferes somewhat with the incision. If it is determined at first when the palmar part is incised that the infection is at all severe, I proceed differently. The incision is continued from below upwards at once cutting the anterior ligament and carrying the incision about an inch up on the forearm. This latter is made, as much to drain the subcutaneous area above the wrist, which commonly becomes infected, as to open the sheath. This incision is always supplemented by a transverse drainage above the wrist joint as follows: At a point about one and one-half inches above the tip of the ulna an incision is made directly down on this bone at its flexor surface, an artery forceps is now thrust across the flexor surface of this bone and the radius until it impinges on the skin at the radial side, where the knife cuts down upon it. The incisions in the skin are now enlarged to the length of an inch and a half or more and the artery forceps opens the subtendinous area to the same extent. Especial care should be used here to make the incision neither too far upon the flexor surface nor dorsally since in the first instance, especially upon the radial side, the artery may be injured either by the primary incision or subsequent necrosis and in the second instance, if the incision is too far dorsal it will not drain easily. If the primary incision is made low down and on the radial side the danger of injuring the radial is greater. With the proper precaution, no anxiety need be felt. (Figs. 17 and 21.) Having opened this area the finger is now inserted under the flexor profundus tendons and if there is any infection of the sheath it is bulging and can be opened easily. In case it is not found easily, flexion and extension of the fingers will locate the tendons involved and the palpating finger pushed up among them, or an artery forceps can be pushed down from the bursa which has been opened in front. Its point is felt plainly by the finger and the opening dilated freely. As a matter of fact, the infection will be found to have ruptured into this space in practically every case, except in the very earliest stages. I wish to emphasize that it is this incision that I depend on for drainage of the upper end of the bursa, since it extends upwards on the tendons on their posterior surface. I have even made it in cases where I had made no incision upon the flexor surface of the forearm, or had deemed it inadvisable to cut the anterior annular ligament. Particularly in infections of the radial bursa do I do this. In other words, I use it as a site for entering and drain-

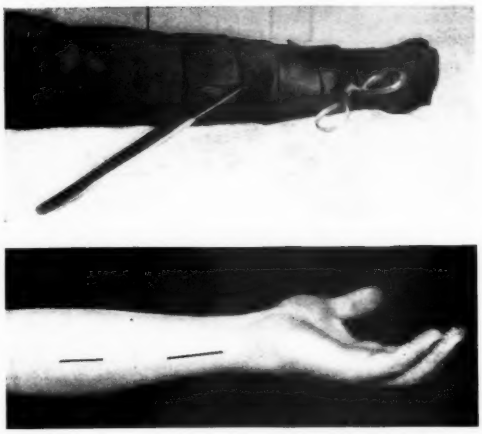

Fig. 21. Photographs showing the proper incisions for draining abscesses in forearm. The photograph above is made of a cadaver arm in which serial sections were made and the proper sites for striking large cavities determined, the artery forceps being thrust through immediately above the wrist, and an ulnar incision being made at the middle of the forearm. The photograph below shows the sites of these two ulnar incisions.

ing the sheath before rupture as well as the site for incision for draining the extension into the forearm. At times when the ulnar bursa alone is involved the incision upon the ulnar side has been found sufficient, and I shall be inclined to use that alone in the future in the uncomplicated cases. It will be remembered that I have already drawn attention to the fact that when extension takes place, this area between the flexor profundus tendons and the

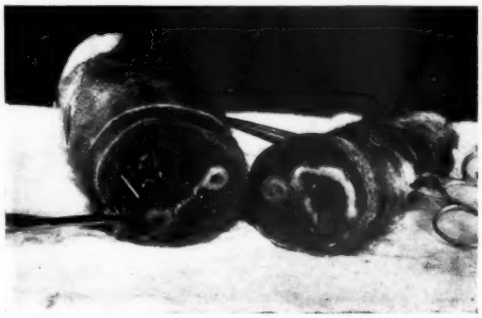

Fig. 22. Photograph of cadaver arm shown in Fig. 21 in which the spaces have been packed with cotton. The knife blade shows the proper site for entering this space in the middle of the forearm. See text.

interosseous septum and the pronator quadratus is always first involved. In the early stages of rupture after having cut through the skin and subcutaneous tissue the operator will be inclined to desist since no evidence of pus will be found. It is not until the area under the profundus is reached that one finds the pus. Again a second fallacious reason for stopping the incision at this stage may be found. There may be a subcutaneous accumulation of pus on the flexor surface of the wrist, in all probability of lymphatic origin; this having been opened the operator feels that he has drained a pocket in direct communication with the tendon sheath or may fear that his diagnosis of tendon sheath infection is incorrect.

Concerning drainage in these wounds, it has been my experience that when made in this manner no drainage is necessary in a majority of cases. At times I insert small strips or gauze thoroughly saturated in vaseline. Rubber tubes I never use.

It seems especially unsurgical to draw rubber tubes or gauze under the anterior annular ligament. The drainage is not improved and pressure necrosis is favored. Moreover, I have had little cause to be displeased with the splitting of the anterior annular ligament. I have not seen a case yet in which I felt that that procedure *per se* had resulted in loss of function and I have frequently seen entire restoration of function after it had been cut.

Treatment of the extension from the little finger and the ulnar bursa. The treatment of the various extensions in the finger proper is the same as that outlined while discussing the index finger. When we come to the base we may have extension either into the ulnar bursa, the lumbrical space, or both. In the more acute cases the former alone is more common while in the more chronic type, it is often both. Here the incision opening the tendon sheath can be made to drain the lumbrical space. Extensions into the middle palmar space are opened by following along the lumbrical space as in the other fingers if the ulnar bursa is uninvolved. If this latter is invaded, the same incision which opens the ulnar bursa may be utilized by inserting the forceps through the synovial wall of the bursa under the tendons

into this space. If the pus has extended over into the thenar space I prefer to drain that by making the incision upon the dorsum between the metacarpal bones of the thumb and index finger and opening it by the forceps as was described above when discussing the extensions from the index finger. The treatment of involvement of the wrist joint was discussed in detail in the earlier contribution dealing with chronic suppurative processes in the hand.

Beginning invasion of the forearm has already been touched upon. Those cases presenting marked involvement of the forearm are best treated by incisions as follows (Figs. 21 and 22):

First incision upon either side just above the wrist, allowing drainage of the subtendinous space under the pronator quadratus as described above. These incisions should be increased to two or three inches in length if the accumulation of pus is large. This is especially true of the ulnar side where even longer incisions can be made with advantage. If the pus has involved the intermuscular septa higher up, the incision should be made about half way up the forearm upon the ulnar side, either just above the level of the ulnar bone or about an inch further up on the flexor surface, the desire being in the first instance to go between the flexor carpi ulnaris and the ulna. Here the muscle must be separated from the bone. In the second instance, we attempt to go between the muscular body of the flexor carpi ulnaris and the inner border of the flexor sublimis digitorum. This latter incison gives better drainage but there is some danger of injuring the ulnar artery either primarily or secondarily. The incision between the ulna and the flexor carpi ulnaris is safer and is sufficiently satisfactory to give good results in a majority of cases. This one incision may be extended for three to four inches and generally is all that is necessary in these cases. The incisions through the flexor surface upon the middle or radial side should be condemned. Particularly in those lying upon the middle, i. e., going through the flexor sublimis digitorum, the inflammatory swelling of the muscular mass acts as an effective barrier to free drainage. I have yet to see the case in which the ulnar incision supplemented by the incisions above the wrist as described failed to give free and satisfactory drainage; moreover, my anatomical researches detailed in the contribution upon "Chronic Phlegmons" as well as a diligent search of the literature and my own experience, both operative and post-mortem (see Case 3), serve to substantiate the value of this procedure.

At times it may be necessary to make some incisions through the skin for the liberation of subcutaneous accumulations of pus, probably lymphatic in origin. The most common site for this is immediately above the wrist.

Secondary hæmorrhage is nearly always from the ulnar. It will generally be advisable to ligate this after verifying the fact that it is the vessel at fault since repeated hæmorrhages are likely to occur if tamponade is depended upon, and the patients are not generally in condition to withstand many hemorrhages.

When the radial bursa becomes involved secondarily to the ulnar bursa, it should be treated as a primary radial bursa infection which we will discuss below. Primary dressing and after-treatment is discussed later.

The following case, demonstrating the correctness of the statements as to the position of pus in the forearm, was seen in consultation with Dr. A. B. Eustace, to whom I am indebted for the history and report of the findings at post-mortem at which I was permitted to be present through the courtesy of Dr. W. H. Hunter and Dr. Eustace. It is a very valuable case since the positions of pus fully corroborate the findings which I have noted clinically in the cases recovered, as well as verify the results which I obtained experimentally and reported in my earlier contributions.

CASE 3. Miss E. J., Cook County Hospital. Patient entered on June 1, 1908. Attending surgeon, Dr. E. Wyllys Andrews; house physicians, Drs. Eustace and Courtenay.

History, present trouble: Patient enters hospital complaining of pain and swelling in right wrist and hand. Upon questioning she says she awoke last Friday night with pain in this joint. There was a sense of heat and the joint was particularly painful on motion. Her sleep was disturbed and by the next morning she says her wrist was notably swollen and red. Tenderness was pronounced over the end of the ulna

posteriorly and also anteriorly over both bones of the forearm at their carpal articulation.

A history of any previous injury, fall, infection, or arthritis of any sort is denied. Accompanying this the patient denies other symptoms of any sort, but since Friday the joint has become swollen and progressively worse, the pain is agonizing, and there is an indefinite history of chills and fever.

Previous Illnesses. For the past ten years she has suffered intermittently from articular rheumatism and three weeks ago she was a patient in this institution for otitis media and discharged after a period of two weeks treatment.

Physical examination. Negative except as follows: The right wrist and hand are greatly swollen and inflamed, the wrist on both surfaces, the hand on the posterior surface only. The swelling is localized to the wrist joint and extends up the forearm for about three inches. The fingers are in semiflexion and the slightest movement causes extreme pain. There is also extreme tenderness around the wrist joint which is also very painful upon motion. Lymphatic involvement is lacking and apparently there is no tendon-sheath involvement. No atrium of infection can be found and shoulder and elbow are O. K. The left arm is not involved though some pain is elicited on motion of shoulder. Fingers give evidence of a rheumatic diathesis.

G. T. COURTENAY.

June 2, 1908:	Pulse	Temperature	Respiration
	94	102	24
	103	102	24
	104	101	22

White blood count on entrance, 8,200. Patient given large doses of sodium salicylate.

Operation, June 4, 1908. Incision down to ulnar bursa and one above the anterior annular ligament on ulnar side. A hæmostat was forced through to the radial side and pus evacuated. Gauze drainage and hot boric dressings. Bier's constrictor applied to arm.

A. B. EUSTACE.

Operation, June 7, 1908. Two incisions on the flexor surface of the forearm just above the wrist joint and another three inches above this. These were each one inch long and penetrated to the flexor tendons openings connected with gauze drainage.

G. T. COURTENAY.

Operation, June 15, 1908. Incision along ulnar bursa enlarged and a large amount of pus evacuated. Knee joint aspirated and pus obtained. 20/0 solution of formalin in glycerine injected. Died June 16, 1908. Autopsy by Dr. A. B. Eustace.

Hand and arm. Extensor surface: On opening back of forearm a small focus of pus is found at junction of lower quarters of forearm. This communicates with incision in skin on side. There was no pus between extensor communis and deeper tissues, except at point indicated and this pus extended down underneath this muscle.

No pus found subcutaneously on the dorsum of the hand except at the wrist joint and this could be traced into the tendon sheaths of the extensor communis digitorum. The tendon sheaths of the extensor radialis longior and brevior also showed pus. The tendon of the extensor carpi ulnaris was free from pus.

Back of the sheath of the extensor communis digitorum is seen an opening extending down to the carpal bones. Articulation between the carpal bones and the radius found to contain a slight amount of pus. Articulation between proximal and distal row of bones also contains a slight amount of pus. No pus found beneath tendons on the back of the hand.

Flexor surface: Incision found in median line, at junction of lower and middle thirds through skin immediately above annular ligament, and on either side at and above articular surface.

Incision on ulnar side extended upward for a distance of two and one-half inches. Incision also in palm of hand on ulnar side lengthwise along inner edge of hypothenar eminence. The hand as a whole does not appear to be greatly swollen and some concavity appears in the middle of the palm.

Upon opening the palm of the hand, ulnar bursa found to be filled with pus and tendon sheath of little finger also filled with pus. Rupture had occurred into the forearm at a point one and one-half inches above the articular surface of the wrist joint. Middle palmar space opened and found to be filled with pus. Thenar space free from pus. Tendon sheath of flexor longus pollicis free from pus. Radial bursa, no pus found at any point. Above the wrist joint, pus is found in sheath passing up underneath tendons from mid-palmar space.

Forearm. Pus is found underneath the flexor profundus digitorum. Pus extended up the forearm in juxtaposition to ulna up to the elbow lying immediately on the ulna

Pus also found along ulnar artery for a distance of about one and one-half inches at middle of forearm but did not extend up to the elbow. A small opening is discernible at lower end of ulna connecting joint with ulnar bursa. It could not be determined definitely whether this opening was made by dissection or was present before.

No opening was demonstrable between wrist joint and radial bursa.

No necrosis of bones of wrist joint; tendon sheath of ring finger intact; tendon sheath of middle finger intact; tendon sheath of index finger intact. Pus extended out in little finger to proximal interphalangeal joint. Periosteum of radius and ulna not destroyed. No pus in elbow joint. Axillary glands, barely palpable.

Heart. No evidence of pericarditis or adhesions.

Pleural cavities. Left, no adhesions; right, few adhesions at apex.

Lungs. Left, crepitates, no consolidation, frothy red serum exudes, apparently normal; right, answers above description.

Liver. Gall-bladder distended and filled with fluid. Liver is mottled on cut sections, the interlobular markings faint, no evidence of miliary abscesses. Tissues very soft and friable and color is paler than normal.

Spleen. Enlarged in size, is soft and friable. Cuts like butter. Miliary abscesses found.

Kidneys. Soft and friable. Capsules strip with some difficulty and leave parts of the cortex. Cortex is almost obliterated as also are the pyramids, but here and there a distinct outline of a pyramid may be found.

Right Knee Joint. Filled with thick yellow pus. Small ecchymotic areas in periosteum.

Cultures before and after death showed staphylococcus albus.

Microscopical examination of the various organs showed acute parenchymetous degeneration.

Treatment of inflammation of the tendon sheath of the flexor tendon of the thumb. Here it is my habit to dissect down to the tendon upon the flexor surface of the proximal phalanx; having entered the sheath, the incision is enlarged along the sac through the thenar eminence separating the muscular mass (heads of the flexor brevis pollicis). It should be remembered that the tendon lies nearer the palm than one would be inclined to think and that the mass of the thenar muscles lies to the radial side of the incision. This is only carried up to within a thumb's breadth of the lower border of the anterior annular ligament, since I have previously shown by observations made upon cadaver hands and reported in an earlier contribution that the motor nerve to the thenar muscles passes across the sheath between this point and the lower edge of the anterior annular ligament and in my opinion loss of the flexor longus pollicis tendon is to be preferred to destroying this nerve and thus bringing about a loss of the muscles which it supplies. The incision begins again at the upper part of the anterior annular ligament opening the proximal end of the radial bursa above this ligament. If the process is severe and there is fear that the sheath may have ruptured, incisions are made laterally above the wrist joint as described under the ulnar sheath infection and the tendon sheath drained from this site. Exceptionally incision upon the radial side alone may be sufficient. If the anterior incision is made subcutaneous pus may be found, leading to the mistaken notion that the sheath has ruptured and is draining into this area. One should not be deterred from continuing the incision going a quarter of an inch to the radial side of the median line of the flexor surface of the forearm. The dissection is carried down to the radial side of the flexor sublimis tendons, avoiding the median nerve in the floor and to the ulnar side. The tendon sheath has generally ruptured by this time or can be identified by a groove director or fine probe passed from the opened sheath below. It is entirely safe to cut the upper part of the anterior annular ligament. (Fig. 17.)

If the infection has shown any tendency to be virulent or extend rapildy I feel that this anterior incision should be limited to opening the subcutaneous accumulation if there be any, and the tendon sheath should be opened by the lateral incisions described above, for entering the space between the flexor profundus tendons and the pronator quadratus. Good sized incisions should be made so that drainage may be free.

In many cases where the infection has been severe or the tendon impaired primary removal of the tendon should be favored. This is particularly liable to die and remain for many weeks causing the infection to persist and jeopardize other structures so that I make it a rule if the tendon is at all destroyed or the infection shows a slow recovery to remove the tendon at once. I am also especially inclined to do this if the ulnar bursa has so far escaped involvement, since the preservation of this is particulary to be sought.

The treatment of secondary involvement of the thenar space, carpal joints, and the ulnar bursa has already been discussed. In relation to secondary ulnar sheath infection it may be noted that there is frequently doubt as to the diagnosis in these cases. It would seem advisable to dissect carefully down upon the sheath in the lower third of the palm just to the radial side of the hypothenar space. After the palmar fascia is cut a pad of œdematous fat will be seen to bulge into the wound as if there were great tension in the sub-aponeurotic palmar space. This fat being dissected away the tense bursa will be seen to bulge into the field. This is opened and the operation proceeds as described above, while discussing the technique of treatment of the ulnar bursa. There is always a grave decision to make as to whether or not the sheath of the little finger tendon has become involved and therefore should also be opened.

When the forearm becomes involved, the

treatment is the same as when the involvement has originated from the ulnar bursa, since the foci of extension are the same.

I report the case of Mr. W. since it is probably the most virulent case of tenosynovitis beginning in the thumb and extending over by way of the tendon sheath of the flexor longus pollicis to the ulnar bursa, that I have had an opportunity to observe. The infection was virulent and the toxic symptoms so severe as to threaten the patient's life. The result was very satisfactory considering the fact that the case did not come under observation until after the sheath had been involved for at least thirty-six hours. I do not doubt but that in this case there will be a complete restoration of function of the entire hand and fingers with the possible exception of flexion of the little finger. This result is in marked contrast to those cases of similar nature which I have seen several days after the sheath had become involved when such destruction of the tendons and their coverings had taken place as to preclude the possibility of a favorable outcome no matter what the surgical procedure might be. The history of this case is practically identical with one I saw two months previously which had remained eight days without opening. The general health and resistance of the individuals were much the same. The outcome in the first case which had been treated conservatively was most disastrous, the patient barely escaping with his life and ending with a functionless hand. After observing these two cases, so close together and with such similar conditions, I cannot but feel that under these conditions conservatism is most inadvisable, and that the earliest possible opening of the sheath is indicated.

Fig. 23. Photograph showing the incision in the case of Mr. W., splitting of the ulnar bursa and radial bursa and incisions above the wrist. Accompanying photographs show result two and one half months after treatment. See case report. (Case 4.)

CASE 4. Mr. W. referred by Dr. Colleran, Post-Graduate Hospital, July, 1908 (Fig. 23).

Patient gave a history of having run a splinter of wood into the distal phalanx of the thumb, seven days previous to coming to the clinic. This had been removed with a pen knife and later another splinter had been removed at the end of five days. Three days before he began to complain of marked pain over the course of the thumb and radial side of the hand. The whole hand now became tender and swollen.

On examination, temperature was 101°, pulse 96. The whole hand was found to be swollen on both the flexor and dorsal surfaces, as was also the forearm. Concavity of the palm was still present. Temperature was most marked at the wrist joint and slightly above on both the radial and ulnar sides. There was tenderness also along the course of the ulnar bursa in the palm of the hand and over the tendon sheath of the little finger. There was only slight tenderness in the palm of the hand. Tenderness is also found over the course of the flexor longus pollicis. There is no tenderness over the index, middle, or ring fingers and none on the dorsum. On extension of the fingers, extension of the little finger and thumb caused marked pain the ring finger slight pain and the middle and index fingers very little pain.

Diagnosis of tenosynovitis of the flexor longus pollicis, the intermediary sheaths at the wrist, and the ulnar bursa was made.

Operation. General anæsthesia; Esmarch's bandage applied. Incision was made through the skin and subcutaneous tissue over the ulnar bursa in the lower third of the palm. After cutting through the palmar fascia the fat bulged into the wound. This was split and the bulging sheath was seen beneath. This was opened and pus found. The sheath was

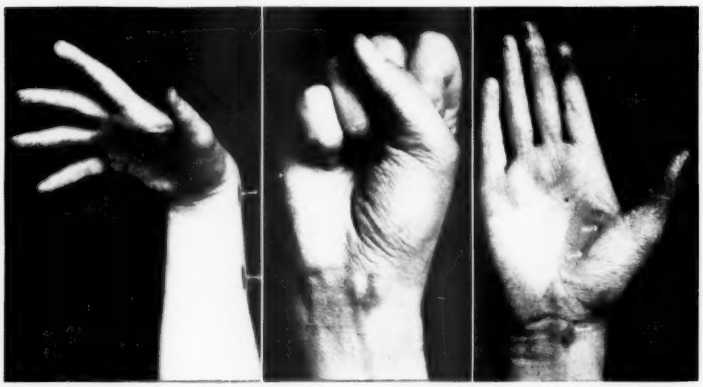

Fig. 24. Photograph showing the function present in case 5; infection of the radial bursa, three months after treatment.

then opened throughout its length from the base of the middle finger up to and through the anterior annular ligament. (See Fig. 23.) Pus was found throughout. An incision was then made in the forearm on either side at the level of the flexor surfaces of the ulna and radius, one inch above the anterior annular ligament, an artery forceps was passed underneath the tendons of the flexor profundus digitorum. A slight amount of pus was found here. An artery forceps now opened the sheath of the ulnar bursa at its upper end passing into the space underneath the flexor tendons and a finger enlarged the opening.

An incision was made over the proximal end of the proximal phalanx of the thumb into the sheath of the flexor longus pollicis. A small amount of slightly turbid fluid was present that was not clearly pus. The opening was extended however to the distal end where considerable pus was evacuated. The incision was then extended upward along the sheath to within a thumb's breadth of the lower border of the anterior annular ligament. Free pus was found here also. An artery forceps was then passed along the sheath up into the forearm underneath the flexor profundus tendons communicating with the opening previously made.

After washing the sheath out thoroughly with normal salt solution, strips of gauze saturated with vaseline were laid between the cut edges of the skin and also drawn underneath the flexor profundus. Hot boric dressings were applied.

Subsequent Course. Pain was immediately relieved, temperature fell to 99°, around which it remained, at no time going higher than 100° and the patient made a gradual and satisfactory recovery. At the end of twenty-four hours the hot boric dressings were changed for dry dressings, the inner layer of which was saturated with vaseline. The strips of gauze between the edges of the wound were removed, the hand was dressed in dorsal extension on a right angled dorsal splint. (See Fig. 25.)

Subsequent Treatment. Each day the hand was dressed, each of the articulations was moved, including the finger joints and wrist, and the hand dressed in dorsal extension. On the fifteenth day it was deemed advisable to open the tendon sheath of the little finger which had not been opened at the time of the operation. A small amount of pus was evacuated and I believe it would have been advisable to have opened this sheath at the time of the primary operation. The incisions over the flexor longus pollicis were completely healed at the end of three and a half weeks. Those above the wrist closed at the end of five days. That over the tendons of the ulnar bursa was completely closed at the end of four and a half weeks. At that time, the patient could move slightly all the fingers of the hand and flex voluntarily, with the exception of the little finger, every joint including the wrist. He was urged to use his hand repeatedly and to return for passive motions. In this respect he was somewhat dilatory. At the beginning of the sixth week his hand was treated daily in the Klapp apparatus for breaking up adhesions, and at the end of the ninth week he began to work with his hand, and at the end of the twelfth week he had practically complete function of all joints and fingers, with the exception of the little finger, where there was only 25 per cent of function. I believe that this will improve, but will never be perfect. (See Fig. 23.)

I report the following case of acute streptococcic infection of the flexor longus pollicis in some detail since it is one in which the patient narrowly escaped with her life, and shows the course in these cases; and because the sheath ruptured permitting involvement of the sub-profundus space without involvement of the ulnar bursa.

The complete restoration of the tendon function in this case is most encouraging. I believe that with an early incision carefully followed by conservative treatment, we can hope for much better results in the future than in the past.

CASE 5. Dr. S., seen in consultation with Dr. Besley, gave the following history. This is abbreviated from the history sheets of the hospital.

Jan. 23, pulse 100; temperature 101.8; respiration 26. Hot dressings applied to right arm; under nitrous oxide anæsthesia Dr. M. L. Harris incised the flexor surface of the thumb. Condition good.

Jan. 24, pulse 80; temperature 98.6; respiration 20. Slept fairly well, condition seems very much improved.

Jan. 26, leucocytosis 11,000.

Jan. 27, pulse 64; temperature 98; respiration 20. Entire thumb swollen and pus oozes from incisions. Thumb again incised by Dr. Charles Davison, drainage inserted. Normal salt enemas given every 4 hours. Hot boric acid solution to part. 5 P. M., pulse 80; temperature 101; respiration 20.

Jan. 29, 4 A. M., pulse 108; temperature 102.8; respiration 26. 8 A. M., pulse 80; temperature 103.4; respiration 22; leucocytosis 21,000. Thumb irrigated with hot boric and peroxide; dry dressings applied. 9 P. M., temperature 102.2; palm of hand greatly swollen and angry red extending into wrist. Vomited small amount of fluid.

Jan. 30, 9 A. M., temperature 101.6. Nauseated and vomited greenish fluid. Face flushed. Slept very little.

Jan. 31, pulse 96; temperature 101.4; respiration 20. Swelling on hand increasing and extending; under gas-ether anæsthesia Dr. F. A. Besley made an incision into the radial bursa liberating yellowish pus. Rubber drain inserted allowing free drainage between first and second metacarpals. Small incision made above wrist but no pus found in arm although there was considerable redness and swelling.

Feb. 1, pulse 84; temperature 102; respiration 20. Slept some since 10 P. M. Pain in hand. Hot dressings. Smears from pus show short chains of streptococci.

Feb. 2, temperature 101.6; leucocytosis 24,000. Feels rather drowsy. Does not have much pain. Slept at intervals.

Feb. 3, pulse 84; temperature 100.2; respiration 20. Cultures on agar and in boullion show only streptococci; leucocytosis 32,800. Under gas anæsthesia incisions enlarged and opened wide by forceps by Drs. Besley and Kanavel.

Feb. 4, 1 A. M., pulse 80; temperature 102. 9 P. M., temperature 101. Slept much of forenoon.

Feb. 5, 10 A. M., temperature 102. Hand dressed. Swelling, hyperæmia, and tenderness along flexor surface of arm, radial side. Pus oozes from wounds. Good night's rest. 4 P. M., pulse 112; temperature 103; respiration 24. Another incision made in forearm by Dr. Besley. The incision was made on radial surface of arm, and liberated large quantity of yellow pus. Gauze packing inserted. Gas anæsthesia. 7:30 P. M., Gauze packing removed. Patient rather restless.

Feb. 6, pulse 92; temperature 102; respiration 20.

Feb. 7, pulse 90; temperature 99.4; respiration 20. Patient very comfortable. Small superficial pocket of pus on anterior surface of wrist opened by Dr. Besley.

Feb. 8, pulse 80; temperature 98; respiration 20.

Fig. 25. Photograph showing the dorsal right-angled splint used after splitting the annular ligament in infection of the ulnar bursa.

From this time on the temperature remained normal. Patient gradually improved and was discharged February 24th. The wound in the thenar space closed about two weeks later.

Subsequent History. At the end of five months, the case presents a complete restoration of function of the muscles of the thumb and the tendon of the flexor longus pollicis, and the tendons of the hand upon flexion. (See Fig. 24.)

Synovial sheaths on the dorsum. When the synovial sheaths upon the dorsum are infected a simple splitting of the sheath throughout its length apparently gives the best results. I have only had four of these cases due to acute infection and they all recovered with good function after a short time, with the exception of the case in which this involvement was associated with a palmar infection, in which a fatal issue followed (Case 3).

AFTER-TREATMENT

Drainage. The use of drainage has been discussed by every surgeon and the principles underlying it here are the same as elsewhere. Those who after much experience and thought

have decided upon its use will probably use it here. My own results have led me to abandon it almost entirely. I never use a rubber tube owing to my fear of pressure necrosis. Gauze, if left in many hours, begins to act as a plug. Unless there is bleeding I generally use none. If, however, I fear that the skin will close down at once and prevent the escape of pus, I insert gauze saturated with vaseline. I have found this to give good drainage and not to act so much as a plug, yet giving tampon pressure in cases of oozing. Strips may be inserted from the sides above the wrist under the flexor profundus and also above into the ulnar incision on the forearm. In my earlier cases I at times drew drainage tubes through from the palm to the dorsum after the older methods of palmar drainage, but since introducing palmar drainage along the lumbrical spaces I have abandoned this procedure entirely.

After the incisions are made every part is thoroughly washed out by normal salt solution from an irrigator or pitcher. Strong antiseptics are never used. In the virulent cases, I make every attempt not to manipulate the arm and hand any more than necessary, so as to protect the patient against absorption of toxines as much as possible. The application of the Bier method of constriction of the arm to prevent the rapid absorption of bacteria and toxines during and immediately after incision, has already been touched upon. During the after-treatment the same precautions are taken as long as the process is acute. The area is kept immobilized and slighty elevated. This latter is done to secure comfort as much as to aid in recovery. The Von Volkmann treatment, i. e., vertical elevation of the hand, has not seemed to me to be of great therapeutic value although apparently it is a valuable procedure in that it prevents excessive œdema in the later stages.

For the first few days after incision it would appear that hot moist dressings are of value to relieve the pain and promote walling-off of the infection. After this stage they should be abandoned in favor of dry dressings, since they seem to produce excessive granulation. In several cases I have been able to apply dry dressings at the end of twenty-four hours. The hot moist dressings are generally made from a saturated solution of boric acid. However, it is probable that the heat is the essential factor. The use of strong antiseptic solutions, such as bichloride and carbolic acid are never used. The inner layer of the dry gauze may be saturated with vaseline to prevent it adhering to the wound.

The hand is dressed from once to twice daily. If gauze has been inserted and has adhered to the wound there is less shock produced by anæsthetizing the patient with a small amount of nitrous oxide than is given by the pain incident to withdrawal without such an aid.

The hand is *dressed with the fingers in extension upon a dorsal splint.* This is done to prevent prolapse of the tendons. In the first few dressings, the hand may be flexed and normal salt irrigation used to wash out about the tendons. In the fingers this procedure is of special importance. Not alone because of the prolapse of the tendons, but because otherwise all of the fingers tend to become flexed in one position.

The prolapse of the tendons at the wrist is prevented by dressing the hand with the wrist sharply bent backwards. I ordinarily mold a plaster of paris splint to fit the back of the forearm up to the wrist; here the plaster splint is bent back at a right angle. The hardened splint is applied to the forearm and held in place by a bandage. A second bandage now attempts to bring the hand back to the horizontal prolongation. At times I have used light elastic pressure. The tension and position are varied from day to day after danger of prolapse has ended, so as to prevent anchylosis of the tendons and joint in one position. The primary splint is applied immediately after the operation (see Fig. 25).

The preventation of adhesions in the joints, preservation of the vitality of the muscles and the use of the tendons is most important, and at times the results are discouraging. Unfortunately the surgeon sees these cases so often after primary incisions have been made and the case treated for several days. In those severe fulminating types this has permitted such destruction of the tendons and synovial coverings as to make any after-treatment of little avail. It seems to me advisable

to *begin passive and active movements within a few days after primary incisions;* in other words, as soon as the danger of systemic infection is over. I do not believe that the local condition is made materially worse and we do aid in the prevention of firm adhesions. I prefer to do this in baths of very hot water which relieves the pain to some extent and helps to cleanse the discharging wound. The patient's hand and forearm being immersed in hot sterile water, the surgeon with glove covered hands gently flexes and extends each finger, as well as the hand at the wrist, several times. Violent movements are not indulged in. The bath is not kept up any length of time, since we wish to prevent rather than favor the development of granulation tissue at this stage. The patient is encouraged to make active movements himself. If a dry, hot chamber is at hand this may be used to advantage. I cannot emphasize too strongly the importance of this early, gentle, and intelligent manipulation. I do not refer to massage but to the intelligent use of the various joints, muscles, and tendons.

Bier and others have used mechanical appliances to produce the same effect. The force may be exerted by exhausting the air in a chamber in which the hand has been placed, the hand or the individual fingers being applied to the fixed end so that when the air is exhausted the joints are flexed or extended. He attributes some of his good results to the therapeutic effect of exhausting the air and producing a hyperæmia. The apparatus also has the advantage that the patient will be more persistent and regular in the application of the treatment than he will be if he depends on treatments by the surgeon alone. The results of treatment may be materially bettered by such an apparatus.

At the present time it is very nearly impossible to state what proportion of cases may hope for a satisfactory outcome. The authors base their statistics upon different classifications. "Good result" is used by some to designate a recovery without loss of any part of the hand with function at the wrist and in the uninvolved fingers, while others insist upon a complete restoration of the function in the finger as well. It is to be hoped that in the future the statistics may be more accurate. A complete functionating hand can always be promised in acute infections of the hand, not involving the tendon sheaths. That is to say, abscesses of the middle palmar space, thenar space, and forearm, as well as simpler conditions can be treated with a perfect result. In tendon sheath infection, however, the results are not nearly so good. By proper and early treatment a perfect result can generally be assured as to function of the wrist joint, hand, and fingers not involved. Where the tendon sheath of a finger is involved, unless early treatment is instituted, flexion of the phalanges of that finger is likely to be lost while flexion at the metacarpophalangeal articulation may generally be preserved. In the thumb, even though the function of the flexor longus pollicis is lost, the hand will not be seriously impaired since the smaller muscles of the thumb will give it such function that the impairment will not be as serious by any means as in the fingers. I hope to compile my complete results at a later date.

Several cases have shown small old sinuses leading from the tendon sheaths of the fingers. Where I could I have applied the Klapp suction finger cup with considerable success.

Where necrotic tissue is being constantly exuded from old sinuses an incision will reveal a considerable amount of such tissue that is better removed by operative measures.

Plastic operations upon the old adherent tendons have been tried without any satisfactory resuls as yet; however, I have cases on hand now in which I hope to present a favorable report later.

Secondary suture of the open granulating wound after the acute process has subsided is recommended by various authors but it is probable that it is seldom indicated.

RÉSUMÉ

Success in the treatment of tendon-sheath infections of the hand depends upon early accurate diagnosis, upon incisions so made as to drain the proper sites without involving uninfected areas, and upon careful after-treatment.

Two types must be recognized, the fulminating and the subacute. The treatment will vary with the type. The most marked symp-

toms and signs are: Localized excruciating pain over the course of the sheath, pain on extension especially at the proximal end of the sheath, and characteristic position of the finger.

Infection from the tendon sheath of the index finger will most often extend to the proximal interphalangeal joint, thenar space, lumbrical spaces, and the surface at the proximal end of the sheath.

From the middle finger it most often extends to the proximal interphalangeal joint, the lumbrical spaces, the surface at the proximal end, and the middle palmar space, although it may invade the thenar space.

From the ring finger the extensions are the same except that it always involves the middle palmar space if extension takes place into the palm.

From the little finger, the most common sites of extension are to the proximal interphalangeal joint (not common) the lumbrical space, the middle palmar space, the surface at the proximal end of the sheath, and the ulnar bursa. From the ulnar bursa, it may extend to the middle palmar space, radial bursa, interosseous space below the flexor profundus, and the wrist joint.

From the sheath of the flexor longus pollicis to the thenar space, ulnar bursa, wrist joint, and interosseous space above described.

Incisions are best made in the fingers, either upon one or both sides of the tendon sheath over the length of the shaft of the middle and proximal phalanx, avoiding the joints, and into the proximal end of the sheaths or the lumbrical spaces to provide drainage there.

The ulnar bursa is best treated by splitting it throughout its length, cutting upon the ulnar side. The anterior annular ligament should generally be cut. This is commonly supplemented by incisions upon the radial and ulnar sides of the forearm above the wrist joint, and on a level with the flexor surface of the bones — through and through drainage is then carried out under the flexor profundus tendons. An ulnar incision may be sufficient. If the pus has invaded the forearm, an ulnar incision is made at the middle of the forearm between the flexor carpi ulnaris and the flexor sublimis or between the flexor carpi ulnaris and the ulna.

Incision of the flexor longus pollicis sheath is made from a finger breadth below the anterior annular ligament to the end of the sheath. Opening may be made above the anterior annular ligament, the upper half of which may be cut, or drainage may be instituted above the wrist by the lateral incision mentioned under ulnar bursal infections.

In the after treatment the Bier constrictor is used for twenty-four to forty-eight hours, hot moist dressings for two to four days, followed by dry dressings, hand being held in over-extension by splint, daily manipulation of joints and muscles after immediate danger of systemic infection has ended.

REMOTE RESULTS OF IMPLANTATION OF THE URETERS INTO THE BOWEL FOR EXSTROPHY

A Consideration of the Extraperitoneal Method of Bergenhem

By J. J. BUCHANAN, M. D., Pittsburg, Pennsylvania
Surgeon to Mercy and Columbia Hospitals

EXSTROPHY of the bladder is one of the rarest of malformations, the combined statistics of Henow, Sickel, and Winckel, according to Spooner (1) showing but 4 cases among the records of 116,500 births. This is a fortunate circumstance; for there is no other malformation that keeps its victim so constantly wretched and renders him so offensive to his associates and so burdensome to those on whom he must depend.

Nature, however, seems to have had compassion for the sufferers from this deformity, and to have shortened their term of life; for Berger (according to Orlow (2)) states that of

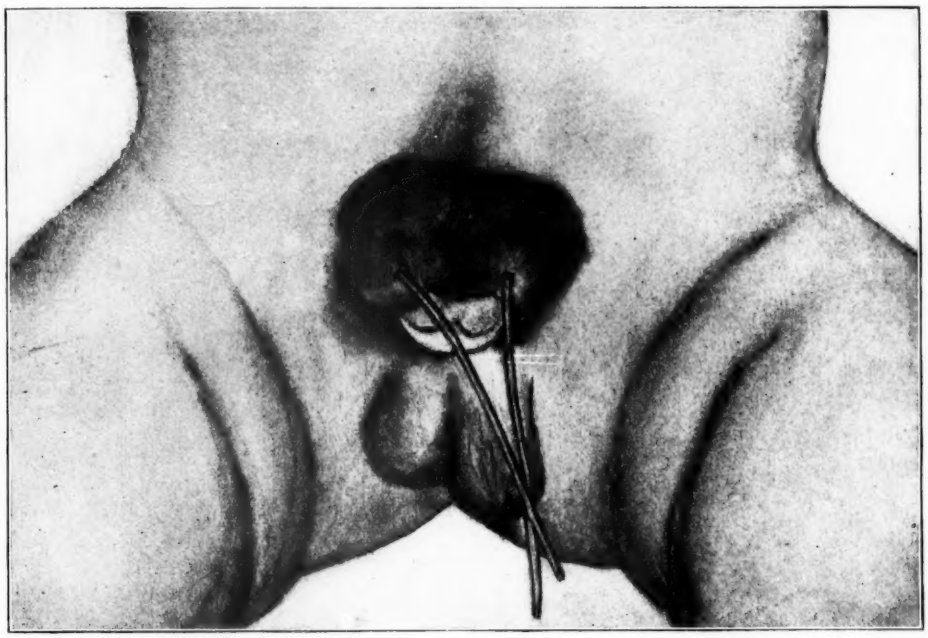

Fig. 1.

74 patients born with exstrophy, only 23 passed the 20th year of life, the others dying of pyelo-nephritis.

Ingenious procedures for the relief of this condition have been devised by many surgeons since the middle of the last century; but no satisfactory results were obtained till 1892, when Maydl first implanted the trigone of the bladder with the distal extremities of the ureters, into the sigmoid flexure, and thus diverted the streams of urine into the rectum.

As early as 1890, Tuffier had concluded, from his experimental and clinical work, that implantation of cut ureters into the bowel would almost invariably be followed by ascending renal infection, and that this could be prevented only by the preservation of the ureteral orifices.

Maydl's operation (trigono-sigmoid implantation), which followed as a natural corollary of this observation, has now had an extended trial, having been performed strictly according to the original method in 80[1] patients, (see tables), of whom 23 have died as an immediate result of the operation, a mortality of 28.7 per cent.

Of the 23 patients dying from Maydl operations, the cause of death is known in 20. Seven of these patients died of peritonitis and nine died of pyelo-nephritis and anuria; the remaining four died of shock, megacolon, hæmorrhage, and meningitis. The fact that four-fifths of all the deaths could be attributed to two causes — the intraperitoneal nature of the operation, and obstruction of the ureters from twisting or kinking, indicates clearly the weak points in the method.

On November 30th of the same year (1894) that Maydl published his first two operations, B. Bergenhem, of Nyköpings, Sweden, operated on a man of 35, by implanting the ureters separately into the rectum by the extra-peritoneal method. This patient had an adenoma springing from a congenitally exstrophied bladder. One month before the implanta-

[1] A considerable number of other cases have been set down by European writers in the list of Maydl operations, in which very decided deviations have been made from the original procedure. If these cases were added, the operative mortality would be still greater.

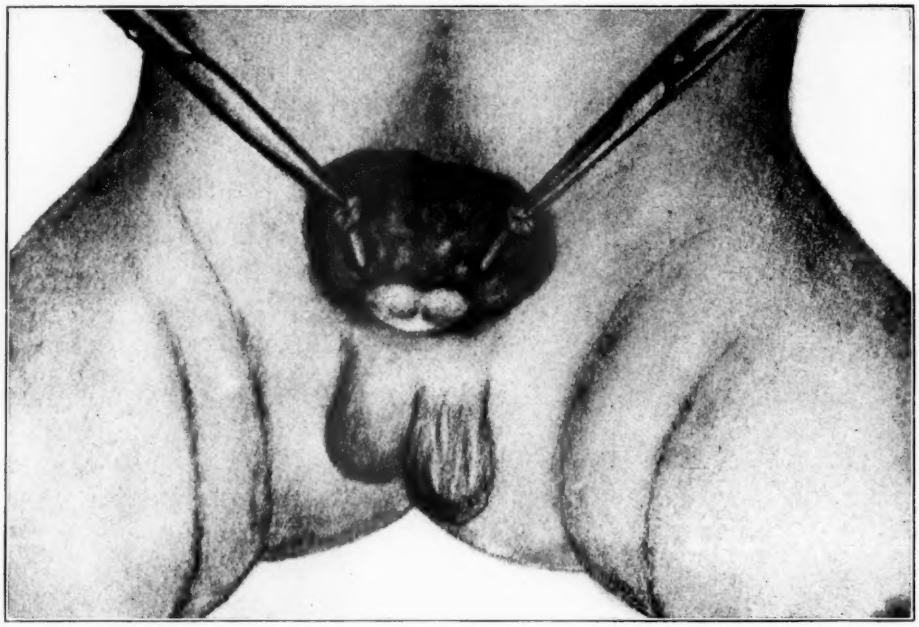

Fig. 2.

tion operation, Bergenhem had removed the adenoma and subjected it to microscopical examination. At the implantation operation, he removed all the bladder wall except an oval piece surrounding each ureteral orifice. He then freed the ureters by blunt dissection, making every effort to avoid opening the peritoneal cavity. The peritoneum was accidentally opened in two small places, which were at once sutured. The rectum was then exposed by a transverse incision in the perineum and opened by two very small antero-lateral incisions, through which the corresponding rosettes of bladder, carrying the freed ureteral ends were drawn. Each ureter was fixed in its incision by a single stitch.

This was the first extraperitoneal implantation of the intact ureters, with rosette of bladder attached, by separate openings into the rectum.[1]

[1] In 1901, Jaja, (66) an assistant of Professor Colzi, of Florence, reported four intestinal implantations for exstrophy. The first of these was performed on May 13, 1894, by separate implantation of the ureters into the rectum, with a small disk of bladder attached to each ureter. A critical examination of the record of this operation would lead to the opinion that this was an intraperitoneal operation, but no definite statement on this point is made, and efforts of the present writer to elucidate the matter have been without avail. The fact, however, that publication was not made till seven years after operation, would bar this case from any claim to priority.

Bergenhem reported his operation a few months later in the Swedish journal, Eira, (3) and an abstract of his paper appeared in *Centralb. f. Chir.* 1896, xxiii, 389.

The *second* operation of this kind was done by Pietro Pozza (4) of Fivizzano, Italy, in March, 1897.

The *third* was done (in two stages) by Franklin H. Martin (5) of Chicago, in 1898.

The *fourth*, by Capello, (6) of Rome, in 1898.

The *fifth*, by A. A. Lendon, (7) of Adelaide, Australia, May 12, 1899.

The *sixth*, by George A. Peters, (8) of Toronto, Canada, July 5, 1899.

In America and Great Britain this operation goes by the name of Peters, who practiced and published it without knowledge of Bergenhem's work; in Italy it is called Pozza's operation; but by all the recognized rules of priority it should be named for Bergenhem, who was the first to devise it, the first to practice it, and the first to publish it.

Bergenhem's operation has been practiced

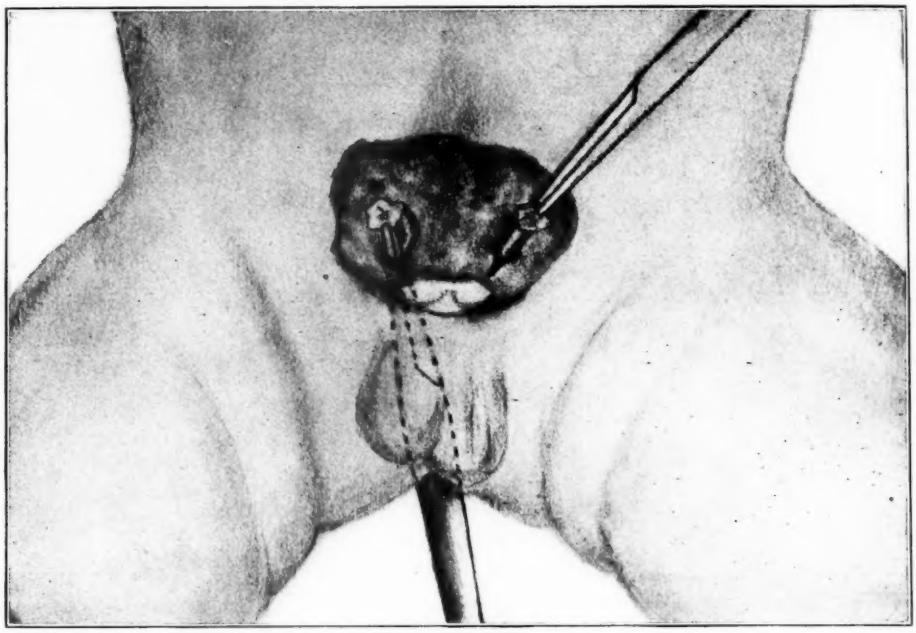

Fig. 3.

in 26 cases, with 3 deaths, a mortality of 11.5 per cent. Two of the fatalities were due to ascending renal infection, and in one the cause was not clearly known, but supposed to be pulmonary embolism. In one of the cases of renal infection the operator attributed the result to the retention of catheters in the ureters for some days after operation. This certainly is an unnecessary and preventable cause of death.

The striking difference in mortality between Maydl's operation (28.7 per cent) and Bergenhem's (11.5 per cent) is largely due to the extraperitoneal nature of the latter. It remains to be seen whether the straight course pursued by the ureters in Bergenhem's operation will result in a lessened late mortality from ureteral obstruction, as would be expected.

Maydl's idea in preserving the trigone was that the ureteral outlet is provided with a sphincter and that this tends to prevent entrance of organisms, and that the muscular fibres of the trigone have the same effect. He also considered the preservation of the trigone important as furnishing a blood supply to the lower end of the ureters.

Margarucci, (9) however, demonstrated at the 12th International Congress at Rome, in 1894, that the ureter is nourished by an independent vascular supply, which, descending from the renal side, supplies not only the ureter, but the mucous membrane about its orifice, where it anastomoses with the vessels of the trigone. This renders it perfectly safe to free an indefinite length of the lower end of the ureters separately, provided the accompanying vessels be respected. At present it seems well established that the interureteral muscular fibres have no sphincteric control, and that the ureteral orifices are protected by a valvular arrangement rather than sphincteric.

For these reasons, the separate implantation of the ureters answers every purpose of the trigonal implantation, both with reference to the preservation of a blood supply and the guarding of the ureteral orifices.

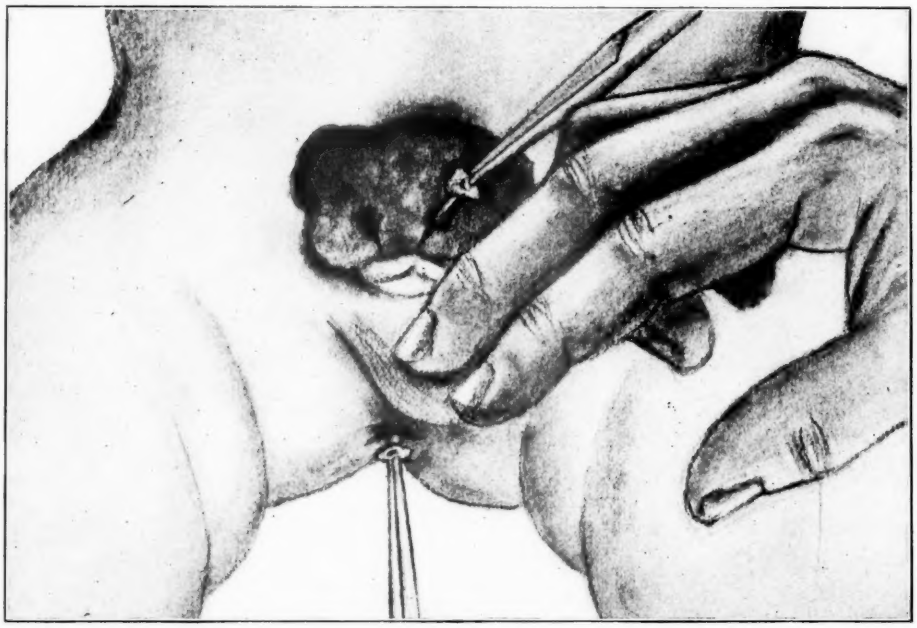

Fig. 4.

The important factors in prevention of ascending infection after ureteral implantation are (1) that each ureter should pass in a direct course, without kink or twist, to the point of entrance into the bowel; (2) that there should be no injury by forceps, knife, or needle, of or near the ostium that could cause a cicatricial narrowing of the passage; (3) that the intra-intestinal portion should keep its position without tension; (4) that no injury should be done the ureter by retention sutures; (5) that the ureteral catheter should be used as a guide in dissection during operation, but not as a conductor of urine afterward; (6) that no dilatation of the sphincter ani should be practiced, a rubber tube to prevent distension being amply sufficient.

A consideration of the simplicity of Bergenhem's operation, its extraperitoneal character, its low mortality, and the favorable course in which the ureters could be placed, induced the writer to perform it in a rather weak baby, ten weeks old, kindly referred by Dr. R. W. Allison, of Wilkinsburg, Pa.

With one exception (Bond's fatal case), this is the youngest child that has yet been subjected to an implantation operation.

Author's Case.[1] Male, 10 weeks old. Seventh child. No other deformities in family. Typical case of exstrophy of bladder.

Operation. Feb. 1, 1908. Ether anæsthesia. Ureteral catheter passed into each ureter as a guide. (Fig. 1.) Each ureter was separated from the surrounding parts, leaving a rosette of mucous membrane about one centimeter in diameter, surrounding its orifice. Incisions were begun below and to the outer side of each ureter, and the posterior surface of each exposed. The surrounding tissues were pushed off from the ureters till the peritoneum was reached and this membrane was pushed upward as the ureter was pulled down till about four centimeters of each ureter was exposed. (Fig. 2.) The catheters were withdrawn. A finger was then passed into the rectum, and this was protruded to the right against the connective tissue at the lower border of the bladder. This connective tissue was slightly dissected up until the rectal wall appeared just underneath the surface. A blunt curved forceps was substituted for the finger and on the point of this forceps as a guide a small incision was made in the antero-lateral wall of the rectum just below the point of emergence of the right ureter. By

[1] This case is also recorded in a paper read at the Medical Society of the State of Pennsylvania, September 17, 1908.

separation of the blades, the opening was stretched just sufficiently to permit the easy passage of the rosette of bladder. (Fig. 3.) This was then seized with the forceps and drawn into the rectum, and out at the anus. (Fig. 4.) The rosette was then released and allowed to retract within the sphincter. The same procedure was carried out on the left side and the distance between the openings in the rectum was one and one-half or two centimeters As each ureter was drawn into the rectum, the rectal wall and ureter dropped down out of sight. The greatest care was taken not to injure the ureters by handling or by pressure of forceps, and the blood supply to the ureters could be seen to be good clear to the end. A few stitches were passed from the remaining bladder wall to the skin margin, to prevent retraction of the ureters from the rectum, to which there was no tendency then or thereafter.

Subsequent History. Patient made a normal recovery without a particle of urine or fecal leakage at any time. Baby now eight months later, is able to retain the urine three or four hours, and gives no indication of irritation of the bowel by the urine, or infection of the kidneys.

Remote History of Patients. No statistics are here given of the comfort or continence enjoyed by the patients after operation. It may be stated in a general way, however, that perfect continence has resulted in nearly all cases, the patients being able to retain urine from three to six hours without discomfort.

I. CASES SURVIVING OPERATION OF INTESTINAL IMPLANTATION OF INTACT URETERS WITH PART OF BLADDER WALL ATTACHED.

	Operator.	Date.	Sex and Age.	Type of Operation.	Late Results.	Source of Information.
1	Maydl, Karl (10), of Prag.	June 19, 1892.	M., 20.	Maydl.	Well 7 years later.	Orlow (2).
2	Maydl, Karl (10), of Prag.	Apr. 17, 1893.	F., 12.	Maydl.	Well 6 years later.	Orlow (2).
3	Maydl, Karl (11), of Prag.	Jan. 20, 1895.	F., 22.	Maydl.	Death from "marasmus" 2 years 10 months later.	Katz (75).
4	Wölfler, (12), of Prag.	Jan. 26, 1895.	F., 9.	Maydl.	Died of pyelo-nephritis, 9 years 2 months later.	Personal communication.
5	Maydl, Karl (13), of Prag.	Nov. 23, 1895.	F., 7.	Maydl.	Well 4 years later.	Druchert (24).
6	Resegotti, Luigi (14), of Come, Italy.	Dec. 12, 1895.	M., 9.	Maydl.	Well $2\frac{1}{4}$ years later.	Druchert (24).
7	v. Eiselsberg, A. (15), of Vienna.	Feb. 21, 1896.	M., 31.	Maydl.	Well 3 years later.	Orlow (2).
8	Orlow, L. (2), of Kharkow, Russia.	May 9, 1896.	M., 12.	Maydl.	Died from double pyelo nephritis 25 months later.	Orlow (2).
9	Trombetta, (17), of Messina, Italy.	June 15, 1896.	M., 10.	Maydl.	Well 12 years later.	Personal communication.
10	v. Eiselsberg, A. (15), of Vienna.	July 30, 1896.	M., 8.	Maydl.	Well $2\frac{1}{2}$ years later.	Katz (75).
11	Ewald, Karl (16), of Vienna	Sept. 14, 1896.	M., 5.	Maydl.	Well 12 years later.	Personal communication.
12	Crespi, (17) of Orvieto, Italy.	Dec. 8, 1896.	M., $2\frac{1}{2}$.	Maydl.	Well 1 year 9 months later.	Katz (75).
13	Korteweg, J. A. (18).	1896.		Maydl.	Death "later" from ascending infection.	Katz (75).
14	Wölfler, (12) of Prag.	Jan. 16, 1897.	F., 8.	Maydl.	Well $11\frac{1}{2}$ years later.	Personal communication.
15	Orlow, L. (16), of Kharkow, Russia.	Apr. 7, 1897.	M., 7.	Maydl.	Well 18 months later.	Druchert (24).
16	Herczel, Emil (19), of Budapest.	May 25, 1897.	M., 5.	Maydl.	Well $2\frac{1}{2}$ years later.	Katz (75).
17	Maydl, Karl (20), of Prag.	July 2, 1897.	M., 4.	Maydl.	Well 2 years later.	Druchert (24).
18	Maydl, Karl (20), of Prag.	Nov. 29, 1897.	M., 7.	Maydl.	Well 2 years later.	Peterson (16)
19	Herczel, Emil (21), of Budapest.	Dec. 20, 1897.	M., 25.	Maydl.	Well 17 months later.	Katz (75).
20	Tuffier, T. (22), of Paris.	Jan. 13, 1898.	M., 15.	Maydl.	Death from pulmonary tuberculosis 2 years later.	Druchert (24).
21	Maydl, Karl, (20) of Prag.	Mar. 24, 1898.	M., 14.	Maydl.	Well 1 year later.	Druchert (24).
22	Maydl, Karl, (20), of Prag.	June 20, 1898.	M., 7.	Maydl.	Well 6 months later.	Druchert (24).
23	Frank, Rudolph (23), of Vienna.	June 28, 1898.	M., 16.	Maydl.	Well 10 years later.	Personal communication.
24	v. Eiselsberg, A. (24), of Vienna.	July 18, 1898.	M., 6.	Maydl.	Well 4 years 7 months later.	Katz (75).
25	Frank, Rudolph (25), of Vienna.	Oct. 31, 1898.	M., 16.	Maydl.	Well 2 years later.	Druchert (24).
26	Allen, Dudley P. (20), of Cleveland, Ohio.	Nov. 3, 1898.	M., 15.	Maydl.	Well 9 years 10 months later.	Personal communication.
27	v. Eiselsberg, A. (15), of Vienna.	Nov. 11, 1898.	M., 12.	Maydl.	Well 1 year 5 months later.	Peterson (16).
28	Maydl, Karl (20), of Prag.	Nov. 20, 1898.	M., $4\frac{1}{2}$.	Maydl.	Well 2 months later.	Peterson (16).
29	Roux, of Lausanne (24).	1898.	M., 2.	Maydl.	Well 5 years later.	Druchert (24).
30	Nove-Josserand, G. (27) of Lyons.	Feb. 24, 1899.	M., $5\frac{1}{2}$.	Maydl.	Well 9 years later.	Personal communication.
31	Herczel, E. (28), of Budapest.	Mar. 9, 1899.	M., 11.	Maydl.	Polyuria 7 months later.	Orlow (2).

32	Ewald, Karl (24), of Vienna.	May 9, 1899.	M., 1½.	Maydl.	Well 8 years 8 months later.	Personal communication.
33	v. Winiwarter, (29).	1899.		Maydl.		
34	Hartley, Frank H. (30), of New York.	Feb. 22, 1900.	M., 3½.	Maydl.	Died of "enteritis" 16 mos. later.	Hartley (33).
35	Forgue, Emile (24), of Montpellier, France.	Mar. 9, 1900.	M., . .	Maydl.		
36	Allen, Dudley P., of Cleveland, Ohio.	Apr. 23, 1900.	M., 32.	Maydl.	Died of renal disease 4 years 5 months later.	Personal communication.
37	Derioujinski, S. (24), of Moscow.	Nov. 29, 1900.	M., 13 mos.	Maydl.	Well 8 years later.	Personal communication.
38	Beck, Carl (31), of New York.	Dec. 9, 1900.	M., 9.	Maydl.	Death from acute pneumonia 14 months later.	Beck (31).
39	Schede, of Bonn (24).	Feb. 24, 1901.	F., . .	Maydl.	Death from unknown cause, some months later.	Druchert (24).
40	v. Eiselsberg, A. (24), of Vienna.	May, 1901.	F., 4.	Maydl.	Well 1 year 8 months later.	Katz (75).
41	Koerte, of Berlin (32).	Aug. 5, 1901.	F., 8¾.	Maydl.	Well 7 years later.	Personal communication.
42	Orlow, L. (16), of Kharkow, Russia.	Nov. 28, 1901.	M., 26.	Maydl.	Well 2 months later.	Orlow (2).
43	Soubotine, M. O. (24), of St. Petersburg.	1901.	F., 2.	Maydl.	Well 1 month later.	Katz (75).
44	Hartley, Frank H. (33), of New York.	Nov. 6, 1902.	M., 18.	Maydl.		
45	Forgue, Emile (34), of Montpellier, France.	1902.	Infant.	Maydl.	Well 1 year later.	Forgue (34).
46	Lambret, of Lille (24).	1902.	M., 5.	Maydl.	Well 4 months later.	Druchert (24).
47	Allen, Dudley P. (35), of Cleveland, Ohio.	July 23, 1903.	M., 11.	Maydl.	Well 5 years later.	Personal communication.
48	Nove-Josserand, G., (36) of Lyons.	Sept. 14, 1903.	M., 11.	Maydl.	Well 4½ years later.	Personal communication.
49	Dollinger, Julius, (37) of Buda-pest.		M., 13.	Maydl.	Well Feb. 27, 1904.	Dollinger (37).
50	Pendl, F. (38), of Vienna.		M., 7.	Maydl.	Well 2 months later.	Druchert (24).
51	Preindlsberger, (24).			Maydl.	Death of pyelo-nephritis and enteritis 10 weeks later.	Druchert (24).
52	Schmitt, Adolph (39), of Munich.	June 20, 1906.	F., 10.	Maydl.	Well 9 months later.	Schmitt (39).
53	Riedel, (40)of Jena.		F., 20.	Maydl.		
54	Vignard (41), of Lyons.	Dec. 29, 1906.	M., . .	Maydl.	Well 1½ years later.	Personal Communication.
55	Riddell, J. Scott (42), of Edinburgh.	Aug. 21, 1907.	F., 6.	Maydl.	Well 14 months later.	Personal Communication.
56	Derioujinski, S. (43), of Moscow.	June 11, 1908.	M., 10.	Maydl.	Well 1 month later.	Personal communication.
57	Derioujinski, S. (43), of Moscow.	Aug. 5, 1908.	M., 8.	Maydl.	Well 16 days later.	Personal communication.
58	Schnitzler, J. (44).	Jan. 27, 1895.	M., 25.	Maydl. Sigmoid anchored extraperitoneally.	Death from operation for urinary fistula 15 mos. later.	Hartley (30).
59	Krinski, Leon (45), of Krakau.	Apr. 23, 1895.	M., 24.	Trigono-rectal implantation.	Well 2 years later.	Orlow (2).
60	Ewald, Karl (46), of Vienna.	July 22, 1898.	M., 3.	Trigono-rectal implantation.	Well 3 months later.	Katz (75).
61	M'kulicz, T. (47), of Breslau.	Nov. 14, 1895.	M., 28.	Trigono-rectal implantation.	Death from double pyelo-nephritis in 4 months.	Hartley (30).
62	Jasinski, R. (48),	1897.		Trigono-rectal implanation.	Well 3 months late..	Jasinski (48).
63	Estor, (24), of Montpellier, France.	Oct. 28, 1901.	M., 15 mos.	Trigono-rectal implantation.	Well 14 months later.	Katz (75).
64	Casati, Eugenio (49), of Ferrara, Italy.	May 19, 1902.	M., 2.	Trigono-rectal implantation.	Death from scarlatina 2 yrs. later. No renal infection.	Personal communication.
65	Moynihan, B. G. A., (50) of Leeds.	Mar. 11, 1905.	M., 19.	Extraperitoneal trigono-rectal implantation.	Well 3 years 4 mos. later.	Personal communication.
66	Gersuny, (30), of Vienna.			Gersuny's modification of Maydl.		Hartley (30).
67	Muscatello, (51), of Pavia, Italy.	June 11, 1903.	F., 9.	Maydl, at first. Plastic of bowel later.	Well 1 year later.	Muscatello (51).
68	Bergenhem, B. (3), of Nyköpings, Sweden.	Nov. 30, 1894.	M., 35.	Bergenhem oper.	Death from unknown cause 3 years 8 months later.	Katz (75).
69	Pozza, Pietro (4), of Fivizzano, Italy.	Mar., 1897.	M., 10.	Bergenhem oper	Death from tubercular meningitis 18 months later.	Druchert (24).
70	Martin, Franklin H. (5), of Chicago, Ill.	1898.	M., 14.	Bergenhem, in two stages.	Well with a fistula 2 years later.	Personal communication.
71	Capello, of Rome (6).	1898.	M., 20	Bergenhem oper.		
72	Lendon, A. A. (7), of Adelaide, Australia.	May 12, 1899.	M., 10.	Bergenhem; secondary reparative operation	Well 6 years later.	Lendon (7).
73.	Peters, George A. (8), of Toronto, Canada.	July 15, 1899.	M., 4½.	Bergenhem oper.	Died of ascending infection 8½ years later.	Starr (58).
74	Pye-Smith, R. J. (52), of Shfield, England.	Sept. 17, 1901.	M., 14.	Bergenhem oper.	Well 4 months later.	Druchert (24).
75	Peters, George A. (54), of Toronto, Canada.	Oct. 7, 1901.	M., 13.	Bergenhem oper.	Well 6½ years later.	Starr (58).

76	Peters, George A. (53), of Toronto, Canada.	Oct. 21, 1901.	F., 1.	Bergenhem oper.	Well 6½ years later.	Starr (58).
77	Bond, C. J. (54), Leicester, England.	May 1, 1903.	M., 17.	Bergenhem oper.	Death about 3½ years later of ascending infection.	Personal communication.
78	Dunsmoor, F. A (55), of Minneapolis, Minn.	Mar. 23, 1903.	M., 15.	Bergenhem oper.	Well 5 years 5 months later.	Personal communication
79	Stiles, W. H. (56), of Edinburgh.		Child.	Bergenhem oper.		
80	Newland, H. S. (57), of Adelaide, Australia.	Mar. 29, 1904.	M., 7.	Bergenhem oper.	Well 17 months later.	Newland (57).
81	Peters, George A. (58), of Toronto, Canada.	Jan., 1905.	M., ..	Bergenhem oper.	Well on leaving hospital.	Starr (58).
82	Sherman, H. M. (59), of San Francisco, Cal.	Feb. 7, 1905.	.., 3½.	Bergenhem oper.	Well 3 years later.	Personal communication.
83	Thomson, Alexis (60), of Edinburgh.	Mar. 29, 1905.	M., 9.	Bergenhem oper.	Death 15 months later of ascending infection.	Personal communication.
84	Armigan, T. V. (61), of Bangalore, India.	Aug. 20, 1906.	M., 18.	Bergenhem oper.	Well 2 years later.	Personal communication.
85	Stewart, R. W. (62), of Pittsburg, Pa.	Nov. 10, 1906.	M., 5.	Bergenhem oper.		
86	Armigan, T. V. (61), of Bangalore, India.	Apr. 15, 1907.	M., 13.	Bergenhem oper.	Well 17 months later.	Personal communication.
87	Starr, F. N. G. (58), of Toronto, Canada.	May 11, 1907.	M., 11.	Bergenhem oper.	Well 1 year later.	Starr (58).
88	Jacobson, J. H. (63), of Toledo, Ohio.	July 1, 1907.	M., 3.	Bergenhem oper.	Well 13 months later.	Personal communication.
89	Murray, R. W. (64).	Aug. 7, 1907.	M., 4½.	Bergenhem oper.	Well with fistula 11 months later.	Personal communication.
90	Buchanan, J. J. (65), of Pittsburg, Pa.	Feb. 1, 1908.	M., 10 weeks.	Bergenhem oper.	Well 8 months later.	Herein.
91	Colzi, of Florence (66).	May 13, 1894.	F., 1½.	Ureters implanted by separate openings in rectum. Probably intraperitoneal.	Death from ascending infection 7 months later.	Jaja (66).
92	Colzi, of Florence (66).	Aug. 10, 1896.	M., 18.	Extraperitoneal. Both ureters into one rectal opening	Well 6½ years later.	Katz (75).
93	Lendon, A. A. (7), of Adelaide, Australia.	July 21, 1901.	M., 10.	Right kidney prev. removed. Left ureter escaped from its rectal implantation.	Death from pyelo-nephritis 2½ months later.	Lendon (7).
94	Jacobson, J. H. (67), of Toledo, Ohio.	Apr. 19, 1902.	M., 29.	Extraper. impl. into rec. by intrap. method.	Death 2 years later from ascending renal infection. Kidneys affected before oper.	Personal communication.
95	Graubner, E. (68), of Dorpat, Russia.	Apr. 21, 1898.	F., 11.	Ureters separately impl. into single sigmoid opening.	Well 5 years later.	Drucbert (24).
96	Thompson, J. E. (69), of Galveston, Texas.	May 1, 1903.	F., 3.	Ureters separately impl. into single sigmoid opening.	Died 4½ yrs. later with symptoms of uræmia.	Personal communication
97	v. Mish, of Tomsk (70), Siberia, Russia.	Nov. 11, 1903.	F., 22.	Ureters separately impl. into single sigmoid opening.	Living 14 months later.	v. Mish (70).
98	Helferich, H. (71), Kiel.	July 25, 1900.	M., 9.	Ureters implanted into two sigmoid openings.	Well 14 months later.	Revenstorf (71).
99	Cameron, J. H.,* of Toronto.	Prior to Sept., 1899.	M., 19.	Bergenhem operation with section of bowel and artificial anus. Rectum used only as bladder.	Well 7 years later.	Personal communication.

* Not included in summary because fecal current was diverted from rectum.

II. CASES DEAD FROM OPERATION OF INTESTINAL IMPLANTATION OF INTACT URETERS WITH PART OF BLADDER WALL ATTACHED.

	Operator.	Date.	Sex and Age.	Type of Operation.	Cause of Death.
1	Maydl, Karl (11), of Prag.	Jan. 2, 1895.	M., 7.	Maydl.	Shock and chloroform narcosis.
2	Sawicki, B. (79).	1896.	M., 7.	Maydl.	Death next day. Left ureter distended. Pus in both.
3	Wölfler, (24), of Prag.	June 26, 1897.	F., 20.	Maydl.	Death on 3d day of pre-existing pyelo-nephritis.
4	Park, Roswell (72), of Buffalo.	1897.	M., 4.	Maydl.	Death in 55 hours from megocolon.
5	Buccheri, (24).	Mar. 13, 1898.	M., 12.	Maydl.	Death on 4th day — slipping sutures.
6	Ehrich, (24).	Mar. 31, 1898.	F., 44.	Maydl.	Death 8th day—pyelo-nephritis probably pre-existent.
7	v. Eiselsberg, A. (15), of Vienna, Austria.	June 14, 1898.	M., 6.	Maydl.	Death next day — general peritonitis.
8	Boari, Achille (73), of Pescia.	Aug., 1898.	M., 19 mos.	Maydl.	Death second day from hæmorrhage.
9	v. Eiselsberg, A. (15), of Vienna	Nov. 11, 1898.	M., 8.	Maydl.	Death 5th day — peritonitis.
10	Gersuny, (24).	1898.	F., 44.	Maydl.	Pre-existent pyelo-nephritis.

11	Allen, Dudley P. (35), of Cleveland, Ohio.	Oct. 26, 1899.	M., 21.	Maydl.	5th day — general peritonitis from separation of sutures.
12	Orlow, L. (16), of Kharkow, Russia.	Nov. 30, 1899.	F., 3.	Maydl.	5th day — peritonitis from separation of sutures.
13	Orlow, L. (16), of Kharkow. Russia.	Oct. 9, 1900.	M., 24.	Maydl.	22d day — pyæmia and double pyelo-nephritis.
14	Schede, (24), of Bonn.	Feb. 24, 1901.	Child.	Maydl.	5th day — double pyelo-nephritis.
15	Woskressenski, (24).	1901.	M., 16.	Maydl.	15th day — double nephritis, and broncho-pneumonia.
16	Buchanan, J. J. (74), of Pittsburg, Pa.	June 10, 1902.	F., 15 mos.	Maydl.	4th day — cause undetermined.
17	Katz, Albert (75), of Braila.	Dec. 8, 1902.	M., 11.	Maydl.	5th day — double pyelo-nephritis.
18	Bond, C. J. (54). of Leicester, Eng.	Jan., 1903.	8 weeks.	Maydl.	
19	Arcoleo, Eugenio (76), of Palermo, Italy.	1903.	M., 14.	Maydl.	Death in 32 hours from anuria.
20	Estor, (77), of Montpellier, France.	1903.		Maydl.	
21	Lambret, (24).	1904.	M., 6.	Maydl.	5th day — meningitis.
22	Nove-Josserand, G. (78), of Lyons.		4 yrs.	Maydl.	Peritonitis.
23	Preindlsberger, (24).			Maydl.	9th day — pyelo-nephritis and peritonitis.
24	Colzi, (66), of Florence.	Dec. 27, 1897.	M., 3.	Extraper. trigono-rectal impl.	3d day — double hydro-nephrosis; sten. uret. orif.
25	Colzi, (66), of Florence.	Jan. 22, 1898.	M., 5½.	Extraper. trigono-rectal impl.	4th day — double pyelo-nephritis.
26	Fritsch, (24).			Uretero-rectal implantation.	
27	Peters, George A. (53), of Toronto, Canada.	Jan. 24, 1902.	M., 4½.	Bergenhem oper.	5th day — double pyelo-nephritis.
28	Murray, R. W. (80).	Sept. 20, 1907.	M., 16.	Bergenhem oper.	8th day — ascending infection.
29	Starr, F. N. G. (58), of Toronto, Canada.	Feb. 27, 1908.	F., 1½.	Bergenhem oper.	2d day — probably from pulmonary embolism.
30	Malinowski, (24).	1900.	F., . . .	Rectal impl. by sacral route.	7th day — general infection.
31	Remedi, Vittoria (81), of Cagliari.	Apr. 6. 1905.	M., 17.	Separate imp. ureters into ext. anchored sigmoid.	4th day — renal failure.
32	Stewart, R. W. (62), of Pittsburg, Pa.	Oct. 24, 1899.	F., 3.	Uretero-rectal implantation. (Intraperitoneal.)	14th day — probably peritonitis.

The present inquiry has been directed chiefly to the remote mortality from ascending urinary infection. No conclusions regarding the effect of intestinal implantation of the ureters in the production of ascending infection of the kidneys would be correct without full consideration of the statistics of Berger, mentioned in the second paragraph of this paper. These statistics show conclusively that the exposed position of the ureteral ostia, in exstrophy of the bladder, constantly tends to produce an ascending infection, and that this infection causes the death of sixty-nine per cent of these individuals before they have reached their twentieth year.

It seems, therefore, almost a certainty that many of these operated patients have had a pre-existent pyelitis, and that in them the operation should not be charged with the fatal results.

An analysis of the subsequent history of all the patients surviving intestinal implantation of intact ureters with part of bladder wall attached, as their records appear in the accompanying table, will show that of 98 patients surviving operation,

11 died subsequently of ascending renal infection (11.2 per cent).
2 died subsequently of pre-existent renal disease.
7 " " " causes other than renal disease.
2 " " " unknown cause.
1 reported subsequently with polyuria.
11 not traced after leaving the hospital.
64 well at last report.
13 reported well within 1 year of operation.
26 " " between 1 and 3 years after operation.
10 " " " 3 and 6 " " "
15 " " " 6 and 12 " " "

When it is considered that of 98 patients surviving operation, only 11 are known to have developed ascending urinary infection, and in these, even, it may have existed at the time of operation; that the immediate mortality of Bergenhem's operation, in the cases so far reported, is but 11.5 per cent, and that it converts a life of misery into one of almost perfect comfort; there should not be any hesitation in advising its performance.

Further reports are necessary in later years to confirm this favorable view, for some of these patients may yet die of renal disease, but at the present writing the facts are as given.

BIBLIOGRAPHY

1. Spooner. Boston Med. and Surg. Jour,. 1905, clii, p. 546.
2. Orlow. Revue de Gynec. et de Chir. Abdom., Par., 1903, vii, p. 796.
3. Bergenhem. Eira, 1895, xix, 265.
4. Pozza. Gazz. degli Osp. Milano, 1898, xix, 293.

5. MARTIN. Personal Communication. Reported in Am. Gyn. & Obst. Jour., vol. xvi, 1900, p. 395. case 55.
6. CAPELLO. Atti Acad. Sc. Med. e Nat. in Ferrara, 1898-1899, lxxiii, 221.
7. LENDON. Brit. Med. Jour., 1906, i, 961.
8. PETERS. The Canadian Lancet, 1899, xxxii, 23.
9. MATAS. Jour. Amer. Med. Assn., xxxiii, 262.
10. MAYDL. Wiener Med. Woch., 1894, 25.
11. MAYDL. Wiener Med. Woch., 1896, No. 28.
12. WÖLFLER. Beitr. z. Klin. Chir., xxiii, 484.
13. MAYDL. Wiener Med. Woch., 1896, No. 29.
14. RESEGOTTI. Centralbl. f. Ch. 1896, 1255.
15. MATHES. Deutsche Zeitsch. f. Ch. xlv, 136.
16. PETERSON. Jour. Amer. Med. Assn., xxxvi, 634.
17. TROMBETTA. Centralbl. f. Chir. 1896, 1255.
18. HILDEBRAND. Jahresbericht, 1896, 925.
19. HILDEBRAND. Jahresbericht, f. Chir., 1897, 828.
20. MAYDL. Wien. Med. Woch. 1899, xlix, No. 6, 7, 8.
21. HERCZEL. Pest. Med.-Chir. Presse, xxxiv, 803.
22. TUFFIER. Gaz. hebdom., 1898, 56.
23. FRANK. Wiener Klin. Woch., 1898, No. 43.
24. DRUCBERT. L'Echo Med. du Nord., 1904, No. 404, 482.
25. FRANK. Wien. Klin. Woch., 1898, xi, 989.
26. ALLEN. Jour. Amer. Med. Assn., 1899, xxxiii, 258.
27. NOVE-JOSSERAND. Revue Mens. des Mal de l'enfance, 1899.
28. HERCZEL. Centr. f. die Krankh. der Harn und Sexual organen, 1899.
29. v. WINIWARTER. Beitr. z. Klin. Chir., bd. xxiii, 1899.
30. HARTLEY. Annals of Surgery, xxxiv, 56.
31. BECK. N. Y. Med. Jour., 1906, lxxxiii, 1001.
32. KOERTE. Verh. d. Gesellsch. f. Chir., 36 Cong. Berl., 198.
33. HARTLEY. Med. News, 1903, lxxxiii, 388.
34. FORGUE. Montpellier Med. 1903, xvii, 617.
35. ALLEN. Personal Communication.
36. NOVE-JOSSERAND. Lyon Med., 1904, cii, 423.
37. DOLLINGER. Pest. Med.-Chir. Presse, 1904, xl, 778.
38. PENDL. Centralbl. f. Chir., 1901, No. 21.
39. SCHMITT. Verhandl. d. Gesellsch. f. Chir. 36 Cong. Berl., 198.
40. RIEDEL. Ibid.
41. VIGNARD. Lyon Med., 1907, cviii, 1087.
42. RIDDELL. Brit. Med. Jour., 1908, i, 975.
43. DERIOUJINSKI. Personal Communication.
44. SCHNITZLER. Beitr. z. Klin. Chir. xxiii, 483.
45. KRINSKI. Centr. f. Chir., 1895, 73.
46. EWALD. Wiener Allg. Med. Ztg., 1898, No. 26.
47. MIKULICZ. Beitrag. z. Klin. Chir. Bd. xviii, 4.
48. JASINSKI. Gazeta Lekarska, Warsawa, 1900, xx, 403.
49. CASATI. Atti della Accad. Delle Sc. Med. e Nat. in Ferrara, 1903, lxxvii, 253.
50. MOYNIHAN. Annals of Surg., 1905, xliii, 237.
51. MUSCATELLO. La Riforma Med. 1904, xx, 1182.
52. SMITH. Yorkshire Branch Brit. Med. Assn., Jan. 29, 1902.
53. PETERS. Canadian Jour. Med. and Surg., Apr., 1902.
54. BOND. Brit. Med. Jour., May 19, 1906.
55. DUNSMOOR. Northwestern Lancet, 1903, xxiii, 163.
56. STILES. Med. Press and Circ., 1903, vol. 75, 83.
57. NEWLAND. Australian Med. Gaz., Nov., 1905.
58. STARR. Canadian Jour. Med. and Surg., Sept., 1908.
59. SHERMAN. Jour. Amer. Med. Assn., 1905, xlv, 890.
60. THOMSON. Trans. Medico Chir. Soc., Edinburgh, 1904-1905, xxiv, n. s. 159.
61. ARMIGAN. Brit. Med. Jour., 1907, i, 1481.
62. STEWART. Personal Communication.
63. JACOBSON. Personal Communication.
64. Liverpool Med.-Chir. Jour., vol. xxix, 142.
65. BUCHANAN. Herein reported.
66. JAJA. Atti della Soc. Italiana di Chir. Roma, 1901.
67. JACOBSON. Jour. Amer. Med. Assn., Jan. 3, 1903, 34.
68. GRAUBNER. St. Petersb. Med. Woch., Sept. 22, 1900.
69. THOMPSON. Trans. State Med. Assn. of Texas, 1904, 388.
70. v. MISH. Khirurgia Mosk., 1907, xxi, 464.
71. REVENSTORF. Ueber die Impl. der Uret. in den Darm. z. Heil. der Exst. Ves. Kiel, 1901.
72. PARK. Med. News, 1897, lxx, 702.
73. BOARI. Atti Acad. Sci. Med. e Nat. in Ferrara, 1898-1899, lxxiii. 221.
74. BUCHANAN. Not hitherto published.
75. KATZ. Traitement Chir. d l'exstrophie de la Vessie, Par. 1903, 169.
76. ARCOLEO. Il Morgagni Giorn. Milano, 1903, xlv, Pt. 1, 419.
77. ESTOR. Montpel. Med. 1903, xvii, 617.
78. NOVE-JOSSERAND. Lyon Med. 1907, cviii, 1088.
79. SAWICKI. Gazeta Lekarska, Warsawa, 1900, xx, 404.
80. MURRAY. Liverpool Med. Chir. Jour., vol. xix, 142.
81. REMEDI. La Clinica Chirurgica, Milano, 1906, xiv, 608.

LOCALIZED NECROSIS OF THE LIVER

BY JOHN A. HARTWELL, M. D., NEW YORK CITY
Surgeon to Bellevue Hospital; Assistant Surgeon to Presbyterian Hospital; Professor of Physiology, Cornell Medical School

THE pathological changes in acute inflammatory processes of the liver present such varied features, and their etiology is so obscure, that the reporting of individual cases is a matter of interest. The following case is deemed worthy of publication because of its bearing on the general subject, and the light it throws on the development of such lesions.

The patient (a woman, and the mother of five children) age 53, always a resident in or near New York City, gave the following history when first seen on June 10, 1903.

As a young woman she enjoyed good health, though she was never robust. There is no history of any acute illness except those bearing directly on the hepatic disease, and an indefinite recurrent malarial infection. The latter was never confirmed by any blood findings, and it is doubtful if any such infection ever really existed. There were no abnormalities connected with

her child bearing. She has never suffered from any symptoms pointing to a dysentery or a colitis. The urinary tract has never showed any evidence of disease.

In 1885 she had a sickness said to be "congestion of the liver." The symptoms are not well remembered, but there seems to be a good deal pointing to biliary colic. Since then she has suffered at various times from "gastric indigestion," with distress after eating, and sometimes nausea and slight jaundice. Fairly severe attacks have occurred at intervals. During the winter of 1902-03 she was in good health up to February, when she had an acute sickness. There was a chill, vomiting, pain in region of liver and through abdomen with slight jaundice. She was sick for two weeks, gradually recovering. Since then she had been fairly well though bilious and dyspeptic much of the time. She had suffered from mental depression amounting almost to melancholia.

Late in May she had a similar attack though not so severe, and there was no jaundice. Since then she has been invalided most of the time with indefinite symptoms like those described. She thinks she has fever a good deal of the time.

During past three months she estimates that she has lost 20 pounds in weight.

Physical Examination. The patient is somewhat emaciated. Color not good. Tongue clean. Mucous membrane fair color. Thoracic viscera normal

Abdomen. Muscles not easily relaxed, and hence palpation unsatisfactory. The liver percusses about 3 inches below costal margin and is distinctly felt. It is not tender or only slightly so. In the right lumbar region is a tumor which gives the impression of enlarged kidney (about 5 inches in diameter), smooth surfaces, can be felt anteriorly and posteriorly, and is easily grasped between the hands. Can be moved toward middle line, but does *not* pass up beneath the ribs in the manner of a movable kidney. It *seems* distinct from lower margin of liver, though this is doubtful. Below it encroaches on inguinal region. Passively it causes no pain, but on manipulation tenderness is elicited and a shooting pain passes upward obliquely toward the left chest.

Bimanual pressure gives elastic sensation, hardly fluctuating. Percussion over it is tympanitic, though dull. It is uncertain as to the nature of the growth. 1st. Kidney (tubercular) (?). 2d. Liver lobe, or gall-bladder, 3d. Neoplasm of colon.

Blood. Leukocytes 6,000 in number. Temperature 101 in p. m.; pulse 70 to 90.

June 12, 1903. Repeated examinations give no more information. Temperature 100-102; pulse 70-100; urinalysis, 1,020 clear. No albumin, no sugar. Occasional epithelial cast. Some leukocytes. No red blood cells and no pus.

June 14, 1903. Temperature fell to normal this morning and remained there during day. Vomiting present, the vomitus consisting of bile and gastric contents, no blood.

June 15, 1903. Temperature 101 this morning. The vomiting stopped and she feels comfortable. Blood examination shows no malaria.

June 17, 1903. She has been under observation for one week but no new facts have presented themselves. Temperature ranges irregularly from 100 to 103. Pulse 70 to 85. Respiration 20. Heart and lungs normal.

June 17, 1903. Operation. Gas and ether anæsthesia. Under anæsthesia there was no new fact concerning the conditions made out. An incision was made in the middle of the right rectus muscle just above the umbilicus. Peritoneum opened. The tumor was palpated and found to be a much enlarged edge of the right lobe of the liver and lying beneath it was a freely movable normal kidney. This latter had a wide field of excursion from its normal position behind the enlarged liver, hence the failure to force it up by bimanual palpation, it had simply gone behind this lobe and the lobe had taken its place between the hands. It could almost be drawn out through the abdominal incision. The incision was enlarged up and down and the following condition presented: The colon was firmly adherent to the gall-bladder and the liver. The gall-bladder was shriveled and tightly adherent in the transverse fissure of the liver. Over an area including the anterior margin of the right lobe, and extending back for four inches, the liver was intensely congested and soft in consistence. It was necessary to cut the adhesions binding the colon to the liver, in doing which, a perforation ¼ inch in diameter was made in the colon. This was sutured with three rows of Lembert silk sutures. The gastro-hepatic omentum was freed and the foramen of Winslow found. Palpation of the ducts showed them to be thickened but no stone could be felt. On the under surface of the liver 3 inches from its margin, and just to the right of the transverse fissure was a softened area in the liver about 3 inches in diameter which seemed to contain fluid, though the aspirating needle gave a negative result. The area was incised and a ragged non-circumscribed cavity opened which contained apparently necrotic liver tissue but no fluid. This was in the area of congestion mentioned above. The gall-bladder was dissected free, tied at cystic duct and removed. Its cavity was totally obliterated except near the fundus where about ten drops of fluid were present. Here a little mucous membrane was found. A large gauze drain with rubber tissue covering was passed into the cavity of liver. The abdominal wall was sutured by layers with plain gut for the peritoneum, and aponeurosis and silk for the skin. Time of operation one hour. The condition of patient was good.

Pathological report by Dr. Ewing. Smears on culture plates from the liver and from the gall-bladder gave no growth whatever. No bacteria could be seen microscopically. Sections of the liver showed marked endarteritis and many vessels were plugged with thrombi some of these being of large size. The liver tissue was necrotic. The bile passages themselves showed comparatively little disease and there was a notable absence of their infiltration with leukocytes commonly seen in cholangitis.

June 18, 1903. No particular shock followed the operation and for 24 hours the condition of the patient

was good, the temperature gradually falling from 103 to normal and the pulse staying about 80. Then the temperature suddenly ran up to 104, pulse to 140, and the respiration to 40. Pneumonia, hæmorrhage, or sepsis was suggested as the cause of this change. No symptoms of peritonitis were present. Under light narcosis the drain which had been acting well was removed. No bleeding was found. The drain was replaced.

The condition remained precarious for six hours, after which she rallied, and with catharsis the untoward symptoms subsided. The condition was one of intense toxæmia.

June 20, 1903. For 36 hours she had rectal feeding, after that gradually increasing fluid diet until 4th day on full fluid diet.

June 23, 1903. Favorable progress has been made in every way. The wound is draining well, about two ounces per day. There is marked bladder irritation probably due to catheterization. Urinalysis 1,010 cloudy. Trace of albumin. Occasional cast. Leukocytes and bladder epithelium rather increased. No real pus. No blood.

June 30, 1903. A purulent cystitis of moderate severity has developed which causes pain and retards convalescence. The wound drains freely but the amount of bile escaping seems rather small.

There is still tenderness over the original site of the enlarged liver. Her general condition seems to be improving though a daily temperature of 101 to 103 is present

July 10, 1903. The continued temperature makes it seem advisable to explore the operative field to see if there is a pus collection. Gas ether narcosis. Original incision reopened. There was about the usual amount of adhesive peritonitis. The wound was explored to its bottom, in the liver. The portion of liver previously diseased was found contracted to half its size and looked entirely normal in every way. There was no collection of pus or bile anywhere but the adhesions made a number of small pockets which could not drain well. These adhesions were broken up making one large cavity and this was drained by a large cigarette drain through the anterior wall and by tube and gauze through a counter incision behind.

July 12, 1903. There has been a copious biliary discharge since the reopening of the wound.

July 20, 1903. Drainage has been very copious and the general condition has improved markedly. The temperature is running lower. Both drains have been gradually drawn out and cut off but have not been entirely removed. The patient now seems convalescent, the temperature being nearly normal.

July 26, 1903. There is a daily rise of temperature 103 to 104 with sweating. Respiration 35 to 40. No signs of any pulmonary complication can be found.

August 10, 1903. The symptoms in last note have continued and there have developed signs of some process in right lower chest. Breathing and voice are exaggerated and almost bronchial in character.

August 11, 1903. A small amount of fluid was found in right pleura by aspiration.

(Diagnosis. Hypostatic pneumonia and pleurisy.)

August 15, 1903. The temperature is normal for the first time throughout 24 hours. Wounds satisfactory.

October 1, 1903. Uninterrupted recovery. Both wounds closed by September 10th.

November 1, 1903. Since operation and convalescence therefrom she has gained in general health and has had none of the old mental depression.

The points of peculiar interest are the following: The patient gives a history of having had a long standing trouble with the gall passages, many of the symptoms leading to the probability of gall-stones having been sometime present. At operation, however, no stone was found, and aside from the atrophied condition of the bladder, no evidence of their previous existence was discovered. The rather dilated common duct may have been due to their passage, but the patient had had neither chronic jaundice, nor frequently recurring jaundice, one of which is almost always seen with the long standing presence of stones in the common duct. Despite these irregularities, however, in the picture it must be granted that biliary calculi were sometime present, and that they were the indirect cause of her subsequent pathological process in the liver itself. It is well known that the formation of these calculi is essentially an infectious process, and a cholangitis is often a sequel to them. A cholangitis thus developing may go on to abscess formation, or it may resolve before this stage. Osler, in speaking of this condition says: "The symptoms of this type of catarrhal angiocholitis are sometimes very distinctive. With it is associated most frequently the so-called hepatic intermittent fever, recurring attacks of chills, fever, and sweats. We need still further information about the bacteriology of these cases. In all probability the febrile attacks are due distinctly to infection. I cannot too strongly emphasize the point that the recurring attacks of intermittent fever do not necessarily mean suppurative angiocholitis."

Strumpell expresses the same view as follows: "The clinical history and the post-mortem examinations in my cases show conclusively that this condition may persist for years without a trace of suppuration within the ducts. There must, however, be an infection, such as may exist for years in the gall-bladder, without causing suppuration. It is probable that the

toxic symptoms only develop when a certain grade of tension is reached."

Both authors, however, lay stress on the presence of a leukocytosis which was absent here.

Its absence is of more than passing interest. An extended search of the literature shows its invariable presence in all infectious processes in the liver, except the amœbic abscess. In not a single case were the leukocytes reported as being normal. F. Pick does report two cases in which the leukocytosis was not present very early in the disease, or during the intervals between the attacks of intermittent fever, which occurred frequently. But when the temperature was elevated there was a leukocyte increase to 23,000. These were cases of infective cholangitis without abscess formation. Unfortunately, later counts in our case were not made. In the amœbic abscess Osler, in his earlier writings says: "Leukocytosis is always present," but in the last edition of his work, he changes this, and says: "It is often absent."

Dr. Ewing, in the pathological report, emphasizes the fact that the disease involved the blood vessels more than the bile passages, and says: "The bile passages themselves showed comparatively little evidence of disease, and there was a notable absence of their infiltration with leukocytes commonly seen in cholangitis." Moreover, such a cholangitis commonly is distributed through a large part or the whole of the liver, and does not cause a focal necrosis such as was found here. His report also showed the absence of any infective agent. This is often the case in long standing abscess in the liver, particularly of the solitary type. But in our case no abscess had ever formed, and if the process were of this nature probably some bacteria would have grown from the cultures. During the long process of healing, too, the discharge was bile, and showed a notable absence of pus. Again, the inflammation developing in the pleura never went on to pus formation, even though the patient was severely toxic at this time. An empyema certainly would have been more than a possibility had there been an active infection going on in the liver and adjacent tissues. These considerations make it evident that some other explanation than a cholangitis, either catarrhal or suppurative, must be sought to account for the condition we are discussing.

Destructive processes in the liver may arise from an irritating body having entered it through the blood stream, particularly of the portal system. Nearly all the solitary abscesses so arise, as do most of the multiple ones, the source of infection being somewhere in the gastro-intestinal tract. The solitary abscess selects the right lobe as the seat of choice, an important consideration because the process in this case was found here. Andrew Davidson, writing in Albutt's system of medicine, reports two cases secondary to dysentery in which one large necrotic area was found at an early stage. He does not report on the bacterial findings. Such a case is also reported by Kelsch and Kiener, and one by Morehead. Pathologically, too, the necrosis was reported as due to "the marked endarteritis and the plugging of many vesels with thrombi, some of large size." It seems, therefore, that the vascular system, and not the biliary system, must be held accountable for the lesion which developed in this patient. But it must be remembered that she had never lived in the tropics, and that she had been markedly free of any intestinal inflammation. It has long been known that many substances other than bacteria in the blood current will produce a liver necrosis, and of late much work has been done in the study of these conditions. Acute yellow atrophy is now believed to be a toxic disease of this sort, and while an actual infection in the liver is sometimes seen, many cases are reported in which no bacteria can be demonstrated. Dushfeld and others have written on this aspect of the subject. In discussing essential jaundice without obstruction, Strümpell says: "The destruction of liver cells is due to absorption of the substances ordinarily changed into bile, and possibly the antecedents of urea brought by the blood current." Frerichs says this cholæmia is due to the absorption of all the improperly formed metabolic substances by the liver, and not to the bile proper. These views presuppose a damage of the liver cells by some poison reaching them in the blood current, which makes them incapable of properly functionating.

Rudolph (Deut. Arch. f. Klin. Med., 1906), one of Hoppe-Seyler's students, reports a degeneration of liver found in association with necrosis of the pancreas. Patient was a woman, 40 years old, with chronic endocarditis. Late in her illness she developed jaundice, and the liver, which before had been large and hard, became softer and smaller. Bile was present in the stools. The urine did not contain sugar, acetone, leucine, or tyrosin. At autopsy the liver was congested, but showed, also, small yellow areas and was jaundiced. The pancreas macroscopically was normal. Antolysis of the liver, as tested by allowing small pieces to digest under toluol, in the thermostat, progressed very rapidly. Microscopic examination of the liver showed, beside chronic congestion, areas of necrosis which were arranged about the periphery of the lobules. In these areas the liver cells were completely destroyed though the contour was retained. The cells were laden with bile pigment. Most of the necroses were free of inflammatory reaction. Microscopic examination of the pancreas showed a great many necroses much like those of the liver, but they seemed older, for there was here some connective tissue formation. Rudolph adopts the view that the liver lesions are due to the destruction of the cells caused by toxic substances swept to the liver by the blood stream, from the necroses in the pancreas.

Oertel (Jour. Experimental Medicine, vol. viii) has recently made some extensive studies of a peculiar destruction of liver cells, to which he gives the name of necrosis of the liver with jaundice. The jaundice is used as referring to changes in the liver, and not to a clinical jaundice, for most of his patients did not show this symptom. He goes particularly into the pathological findings which in general resemble those in Rudolph's cases. In general, the whole liver was involved, but the process was often more advanced locally. He cites four cases, all being patients of poor nutrition and subject to toxic influences, whose liver showed this condition. He concludes that the cell destruction is of the nature of a cytolysis due, not to the imbibition of bile, but probably to the absorption of bacterial toxins from the blood. He sums up the whole condition as follows: 1. There exists a non-inflammatory destruction of the liver, which may be regarded as a pathological entity, in the form of multiple atrophic to necrotic foci of the liver lobules, with bile and blood stasis, and therefore associated with icterus. 2. Evidence indicates that this is probably due to the entrance of a bacterial irritant, either by the bile ducts (Curschmann) or the blood vessels, (present case). 3. The reaction of the liver tissue to this invasion can only be found in localized cirrhosis, most pronounced around bile ducts and vessels, and a proliferation of bile ducts. The sclerosis appears to take its origin around the places of entrance. 4. The disease seems to occur in a previously severely damaged liver, bile stasis, severe alcohol excesses. 5. Inasmuch as the term "necrotic hepatitis" suggests an inflammatory lesion, which is not the feature of these cases, the name "multiple non-inflammatory necrosis of the liver with jaundice" (hepar necroticum cum ictero) seems a more appropriate one.

It must be granted then that a destruction of liver tissue without abscess formation may take place through the absorption into it of toxic materials from the blood. These toxic materials may be either of the nature of substances resulting from improper cell metabolism, or of substances resulting from bacterial activity. Pease and Pearce studied the latter on horses immunized with diphtheria and tetanus toxins, and report their conclusions as follows in the Journal of Infectious Diseases, 1906.

In a series of 12 horses, actively immunized with the products of certain pathogenic micro-organisms, autopsies revealed widespread liver necrosis in nine, and localized liver necrosis in one. Thrombosis of the portal veins was present in three, of the splenic vein in two, and of branches of the pulmonary artery in one, of the nine horses showing widespread necrosis. One horse had thrombosis of branches of the portal veins and another of the pulmonary artery without liver necrosis. Six horses were not carefully examined for thrombosis. The evidence obtained tends to exclude the materials such as peptone, beef extractives, and antiseptics, such as carbolic acid, injected with the toxins, and also the repeated bleed-

ings practiced, from any important role in the production of the liver necrosis. On the other hand, the evidence leads to the conclusion that the toxic bacterial products injected are directly or indirectly responsible for the production of this pathological condition.

The evidence is not sufficient to determine which, if any, of these factors is responsible for the occurrence of the venous thrombosis. A possible etiological action by the antiseptics injected is excluded. In some cases the portal thrombosis may result from the liver necrosis.

In one of these horses only, a focal necrosis in the left lobe took place. This one is, however, sufficient to show that such a possibilty exists.

Turning now to our case, is there any justification in considering it as a case of localized necrosis of the liver, due to toxic substances reaching it in the blood stream, which substance either destroyed the cell itself, or damaged it to such an extent that it was destroyed by autolysis? There is sufficient evidence that such a condition may be a local one, as evidenced in the case of the horse, and in those cases where an infection proper, reaching the liver by the blood current, only attacks one lobe. There is also sufficient evidence as shown in Pease and Pearce's work, and in the statements of authors quoted clinically, that liver necrosis does occur in both of these ways. To prove that this individual case belongs here is perhaps difficult, but for the following reasons it seems proper to assume that it does. 1. Pus was absent, and no bacteria could be demonstrated either microscopically or by culture. 2. There was no leukocytosis, which is present almost invariably in suppurative conditions proper. 3. Very little pus, if any, ever drained from the wound, and the pleural inflammation was not purulent. 4. The bile ducts were free from disease, while there was found necrosis of the liver-cells and thrombi in the vessels (Pease and Pearce found these thrombi in the horses). These considerations seem to throw out an actual bacterial infection. The question then resolves itself to this. Have we any evidence here to explain the presence of these thrombi? It must be acknowledged that there is nothing positive though much that is suggestive. There had existed a long history of some gall duct disease, probably gall-stones, which means an infection. At times, the toxæmia from this had been of a severe grade, as shown by recurring attacks of fever and general symptoms. There had existed for years a condition of chronic toxæmia as shown by the headaches and the mental depression, often amounting to a melancholia. This latter gradually subsided after her convalescence from the liver drainage, and has not been present for more than four years. This may be coincidence, but it is well known that such a mental state is often a concomitant of chronic toxæmia and auto-intoxication. It, therefore, seems fair to assume that the lesion later found in active progress in the liver, had been of long standing, and as a result the final necrosis took place. In the necrosis occurring in the horses, the process only developed after several years of immunization with powerful pathogenic toxins. The observers are unable to explain the thrombosis, and say that this may be secondary to the necrosis itself, and not the cause of it. At the same time they exclude everything except the toxins as being responsible for the changes, whether these were primary in the live cell, or in the blood vessels. Typhoid toxins undoubtedly produce vascular thrombi though not, as a rule, in the portal vessels. Finally, if we grant that toxins were the exciting cause, how can their origin be explained?

The following explanation suggests itself, and has the facts given above to substantiate it. The long standing infection in the lower bile passages produced the toxins. The firmly adherent colon, with its damaged wall in contact with the liver, may also readily have been a factor in their production. From these areas they were washed into the liver by the portal blood stream. A lowered resistance from some cause, possibly the presence of an interhepatic calculus at a previous time, existed in the right lobe of the liver, and here a focus of thrombosis and necrosis resulted, which, having once started, was progressive. A calculus alone would not account for it, because this results, not in necrosis, but in secondary cirrhosis as pointed out by Strümpell and others. It will be noted that while the height

of the process was localized, the greater part of the liver was enlarged and soft, and it is an open question whether, if the disease had been left to itself, ultimately a much greater destructive involvement would not have taken place. Prabably, too, micro-organisms would sooner or later have been deposited in the damaged liver area and a true abscess would have resulted.

The operation furnished a means of external outlet for the poisons and these gave the liver an opportunity to return to the normal. Only when a free outlet was established did recovery take place, and the patient nearly died because at first this was not provided. At the subsequent opening of the wound on July 10th (the first operation was on June 17th, the liver appeared normal in every way. At the present time the patient is in excellent health, and the liver is barely palpable through a very lax abdominal wall.

TUBERCULOSIS OF THE CÆCUM

With Report of a Case

By R. O. ROGERS, A. B., M. D., Richmond, Virginia
Adjunct in Principles of Surgery and Clinical Surgery; Instructor in Anatomy in the Medical College of Virginia

THERE is perhaps no subject in medical literature about which so much has been written as tuberculosis. It matters not in what tissue or organ of the human body one may be interested, in studying the diseased processes of such tissue or organ a tubercular lesion is always a possibility and has to be considered. The ileocæcal region, the diseased processes in which have attracted so wide an interest among surgeons of recent years, is no exception to this rule. Tuberculosis this region, so commonly a secondary in infection to advanced pulmonary tuberculosis, occurs, nevertheless, more rarely as a definite and more or less independent lesion affecting principally the cæcum. This form of tuberculosis, rare as it appears to be from the literature on the subject, possesses an especial interest from a pathological viewpoint, and is of importance to surgery because of the possibility of its complete eradication by surgical treatment.

Frequency. The frequency with which tuberculosis occurs in the cæcum is difficult to estimate. In 1,000 autopsies held upon adults dying of tuberculosis, Eisenhardt (4) found secondary infection of some portion of the bowel 566 times. Hemmeter (2) recently in personal studies upon 56 autopsies in persons dead from pulmonary tuberculosis found the intestines diseased in every case, showing either a tubercular enteritis or an ulcerative condition. Wagener (6) in writing upon the frequency of primary intestinal tuberculosis in Berlin, among 410 cadavers, found primary tuberculosis in 20 cases; it occurred much more frequently in children. It is impossible to say how often and to what extent the cæcum shares this infection, either in the primary or the secondary forms. Certainly nearly all intestinal tuberculosis affects principally the lower ileum, cæcum and adjacent colon. Fenwick and Dodwell (7) in the largest number of autopsies obtainable — 2,000 cases — found the cæcum involved in 85 per cent of all cases. The type of tuberculosis of surgical interest which has its focus of origin in the cæcum itself and which remains limited to the cæcum until far advanced, hyperplastic in its pathological evolution, is extremely rare. Conrath (1) has collected 85 such cases appearing in the literature prior to 1898. In 1907, Hartmann (3) collected 229 operations for ileocæcal tuberculosis, and to this number Cumston (8), of Boston, has added two cases. In writing of tubercular affections of the cæcum and appendix, the list of titles of works consulted numbering 202, Campiche (9) reports 370 cases. It is quite reasonable to assume that a large number of these cases were hypertrophic tuberculosis of the cæcum with simultaneous or secondary involvement of the appendix. It is

certainly probable that this interesting form of tuberculosis occurs far more frequently than appears from the literature, and, as suggested by Hemmeter (2), it is not only possible but highly probable that many cases of cancer of the cæcum which have been reported cured after resection were in reality hypertrophic tuberculosis.

Pathology. Tuberculosis affecting the cæcum, as already seen, occurs in two distinct and more or less well-defined forms: 1. Tuberculosis having its focus of infection in the mucous membrane and affecting usually the lower ileum and cæcum simultaneously; 2. The so-called hypertrophic tuberculosis of the French, which is confined chiefly to the cæcum.

The first variety occurs almost entirely secondary to an advanced tubercular lesion elsewhere in the body, usually secondary to pulmonary tuberculosis, the process having been excited by sputa which have been swallowed. Primary intestinal tuberculosis is exceedingly rare, and while autopsical investigation has established its claims to an independent affection, Koch (10) has largely discredited its existence. Rarely this affection is miliary, manifesting itself in a diffuse enteritis with evidences of tubercles and giant cells. The common lesion, however, is the tubercular ulcer, which is a result of coalescence of several tubercles with ultimate caseation and sloughing. These ulcers, at first small, enlarge to some extent, their edges are elevated and thickened, irregularly oval in shape, and usually run transversely around the lumen of the gut, except when Peyer's patches are the seat of ulceration, when the ulcers run longitudinally. The entire thickness of the gut wall may be involved, and when this occurs a local peritonitis is set up, although perforation is rare on account of the adhesions which are formed. Where the patient has an advanced primary tubercular lesion, these ulcers, as in any other marantic condition, proceed with unrelenting destruction. Where the patient still possesses some degree of resistance, however, the ulcers show some tendency to heal with a cicatricial contraction — a stricture, according to Eisenhardt (4), resulting in 25 per cent of the cases. Ulcers located in the cæcum possess the same pathological characteristics as elsewhere in the bowel, except that there is not the possibility of stricture, owing to the caliber of the cæcum being notably larger than the caliber of the ileum. The mesenteric glands may be involved in any instance.

An intermediate form of cæcal tuberculosis — enteroperitoneal form — has been described by Hartmann (3), later by Cumston (8). The course is usually an extensive ulceration of the mucous membrane which rapidly extends to the peritoneum with involvement of the mesenteric glands. The process is rapid and destructive, and the cæcum and a portion of the ileum which are involved at the same time become plastered down to neighboring structures; a multiple abscess formation occurs early with the development of fistulæ which may communicate with adjoining viscera or may open on the surface externally. It is fair to suppose that the onset in these cases is not unlike the true hypertrophic type, and that subsequently a caseous supersedes a sclerous evolution, a low grade of resistance in the body being responsible for the more rapid and destructive type.

The two foregoing types of tuberculosis — if the last type may be considered independently — are of interest only from the standpoint of pathology. The type now about to be described possesses a warranted degree of surgical interest because by surgical methods a complete eradication is possible. Consequently, reference hereafter is made only to the hypertrophic or surgical type of cæcal tuberculosis.

Hypertrophic tuberculosis of the cæcum, unlike the ulcerative form, is usually a primary affection. The lungs may be involved simultaneously, but generally slightly if at all. Cumston (8) in his report of two cases with a rather extensive review of the literature on the subject states that if the lungs are involved at all they are involved only secondarily. In any event, the most probable conclusion is that the infection is brought about by ingested food, natural stagnation in the ileocæcal region favoring inoculation. The affection is limited nearly always to the cæcum alone. If the ileum has taken part in the process, the disease has advanced generally to a marked extent, and the chances are that an ulcerative condition

has been superimposed upon the original lesion. The disease, on the contrary, more commonly extends along the colon, and in one case reported the entire colon as far as the sigmoid was affected; this is the exception. The origin of the disease is ordinarily in the submucous layer of the gut wall, affecting the lymphatic structures in this situation; less commonly the process apparently begins in the subperitoneal cellulofibrous structures. The process is exceedingly slow, and the foci of infection, which may be limited to one portion of the gut wall or may be distributed more diffusely, act as a kind of irritant exciting, so to speak, an inflammatory reaction which constitutes the so-called sclerous evolution. Through such an evolution the walls of the cæcum become enormously hypertrophied and thickened, and the cæcum presents the appearance of a real neoplasm. This hypertrophy is confined almost entirely to the submucous and subperitoneal structures where the tubercular process and the inflammatory reaction are going on together. The lumen of the cæcum becomes much diminished in caliber, not from any cicatricial contraction, but entirely from an encroachment upon the lumen by the thickened walls. The ileocæcal valve may take part in the process, but more usually a partial stenosis is present from retraction or distortion of the valve or by an actual encroachment upon the valve by the thickened cæcum. The cæcum externally is irregularly nodular in outline, and is intimately associated with pericæcal fat which has undergone a fibrous change — a condition closely simulating fibrolipomatous structure which surrounds a tubercular kidney. This process, which is not unlike that taking place in the gut wall itself, constitutes a kind of barrier or a defensive process which acts as a limitation to the infection. The mucous membrane may be intact throughout, or it may slough away in places where there is extensive caseation and necrosis of foci just underneath. In other cases there is a circumscribed cavity in the cæcal wall, as occurred in our own case, just the same as may be found in a mild pulmonary lesion. Microscopically the process is especially interesting. The mucous membrane when intact shows marked thickening with hypertrophy of the glands, at times polypous projections. The submucous and subperitoneal structures, as already stated, are the areas of infection foci, and it is here that the battle is waged, slowly but unrelentingly disastrous, between the destructive tubercular lesion and the constructive inflammatory process. Tubercles and giant cells may be scattered rather diffusely, but are especially marked in the areas of focal infection. Small embryonal cells everywhere are to be seen constituting the so-called inflammatory constructive process already referred to. The muscular layer does not ordinarily appear to be changed except the infiltration with round cells. The appendix in cæcal tuberculosis is usually affected secondarily and may possess the same hypertrophic changes that occur in the cæcum itself. In our own case it was much thickened, curled upon itself, and was adherent to the base of the cæcum. On account of the pronounced stenosis which is almost invariably present at the ileocæcal valve, a compensatory hypertrophy may occur in the walls of the ileum; this may extend as much as two or three feet in the ileum, is most marked near the obstruction, and gradually diminishes upward. The mesenteric glands in the ileocæcal angle are as a rule involved. Finally, on account of tuberculosis rapidly progressing elsewhere in the body or by an intercurrent malady the patient's resistance becomes lowered, the disease may suddenly flare up in the cæcum, and a caseous may take the place of a sclerouse volution with multiple abscess and fistulous formation — a condition similar to, if not identical with, the so-called enteroperitoneal type of cæcal tuberculosis.

Symptoms. The onset of tuberculosis of the cæcum is very slow, and occurs most always in the second and third decades of life. It may arise in a person who is well nourished and who is otherwise in perfect health, or, as is most commonly the case, the patient is the subject of malnutrition and is more or less anæmic and emaciated. While the disease is still in its incipiency, constipation alternating with diarrhœa, with an occasional trace of blood in the stools, may be the only evidence of any pathological change. After a time, however, all of these patients complain pretty uniformly of abdominal pain and other

evidences of an increasing obstruction. The pain comes on at irregular intervals without known cause, is colicky in character, and commonly localized in the region of the cæcum. During the attacks of pain, the patient rarely may vomit distressingly, the abdominal muscles may become rigid, and as the attack subsides there is generally some abdominal tenderness, particularly marked in the right iliac fossa. In the majority of instances, certainly before the disease is far advanced, the attacks are not severe, the pain is slight and accompanied only by nausea. Again, apparently latent for some time, the trouble may flare up suddenly and the accompanying phenomena be those of a circumscribed peritonitis. As the process advances and the stenosis becomes more marked, considerable distension may accompany the attacks, and there is visible peristalsis with gurgling and splashing sounds over the cæcum — the abdomen finally becoming flat as the attack subsides. Trouble in the ileocæcal region is suggested at once, and a further examination reveals the presence of a tumor. The tumor is variously described as cylindrical or oval in shape, in size varying from a hen's egg to an orange, and is hard and resisting with an uneven surface. At first the growth is more or less movable, particularly towards the median line, but later may become fixed owing to the adhesions which bind the cæcum to neighboring structures. In a number of cases, only an indefinite mass can be felt, causing one to suspect rather a knotty case of appendicitis. A rise in temperature is not the rule. The blood findings may be those of tuberculosis elsewhere. The diazo reaction is uniformly present in the urine. Finally, in the neglected cases, as already stated in the pathology, extensive suppuration within or around the tumor may occur with the formation of fistulæ.

Diagnosis. A diagnosis of a tubercular process in the cæcum is extremely difficult, and without a minute and painstaking examination into every detail of the history of the case and physical findings, an incorrect diagnosis will be made in the vast majority of cases previous to an abdominal section. Even when a condition has been found present in the cæcum which demands a resection, and the growth has been removed, it is difficult then in a number of cases to say, without an exploration of the tumor, whether one is dealing with tuberculosis or cancer. The frequency with which a surgeon meets with appendicitis, and the curiously manifold manifestations of this disease, make one a little bit careless, and, whatever the lesion in the right iliac fossa may be, there is always an irresistible tendency to arrive at the conclusion that the appendix is at fault. The error, too, is a logical one, for fibrinous appendicitis with its exudate and matted adhesions can certainly produce a condition which closely simulates the phenomena of cæcal tuberculosis. The general condition of the patient, however, the long duration of the symptoms, and the persistency of the tumor should point to either tuberculosis or cancer; while, on the contrary, appendicitis is quite evident if a mass of more recent origin disappears at the same time with the accompanying digestive disturbances upon the employment of the proper Fowler position and rectal saline. The solution of the diagnosis is still more difficult since it is by no means impossible for an appendicitis to co-exist with the tubercular condition in the cæcum. In the differentiation between tuberculosis and cancer, no single symptom or hardly a group of symptoms is characteristic of either, and all of the evidence taken together is only of limited value. Boas (5) differentiates as follows:

TUBERCULOSIS OF CÆCUM.	CARCINOMA OF CÆCUM.
Age	
Usually the second to the fourth decades.	Seldom before the fourth decade.
Duration	
Extremely chronic.	That usual for carcinoma.
Lungs	
Frequently more or less pronounced tuberculosis.	Examination of the lungs negative.
Tumor	
Considerable extension in the length of the intestine; the infiltration can be shown by palpation to involve the bowel.	The tumor has a definite outline which is usually strictly limited to that of the cæcum. The latter cannot be felt much.

Symptoms of stenosis	
Always present; distinguished by remarkable murmurs.	Symptoms of stenosis may be entirely absent; when present, are usually less pronounced than in cæcal tuberculosis.
Condition of the stool	
Blood and pus very seldom; tubercle bacilli very often present.	Blood and pus are not infrequently found; never any tubercle bacilli.
Fever	
Not infrequently observed.	Fever exceptionally present.
Urine	
Ehrlich's diazo reaction is present.	Diazo reaction always negative.

Treatment and Results. The treatment of the hypertrophic type of tuberculosis of the cæcum is truly surgical. Hartmann (3), in collecting the statistics upon operations performed up to 1907 for this condition, summarizes as follows:

9 partial excisions of the cæcum, 8 cures, 1 death.
78 resections with end-to-end anastomosis, 59 cures, 19 deaths.
19 resections with end-to-end implantation, 16 cures, 3 deaths.
31 resections with end-to-end anastomosis, 26 cures, 5 deaths.
10 resections in two sittings, 7 cures, 3 deaths.
29 short-circuitings (ileocolostomies), 25 cures, 4 deaths.
9 unilateral exclusions, 8 cures, 1 death.
22 bilateral exclusions, 20 cures, 2 deaths.
22 patients which have undergone multiple operations, 14 cures, 8 deaths.

Total, 229 cases operated on with 46 deaths.

Resection is by all odds the preferable operation. The question of a method of anastomosis does not appear to matter materially, and improvement in technique seems to be more responsible for a reduction in mortality than any method of operation, as demonstrated by a death rate of 12 per cent in all cases operated on after 1900 as against 30 per cent prior to that time. A resection which includes the mesenteric glands at the ileocæcal angle with end-to-end union by suture would seem at least the plausible plan of treatment to pursue.

REPORT OF CASE

For the report of the case which follows I am much indebted to my chief, Dr. J. Shelton Horsley, in whose clinic at the Memorial Hospital this case was operated upon. I am also grateful to Dr. Greer Baughman, Professor of Pathology in the Medical College of Virginia, who is largely responsible for the microscopical pathology in the case. While not possessing all the characteristics of cæcal tuberculosis, the case may be considered a fairly typical demonstration of this interesting condition.

History. Patient, Mrs. P. O. R., white, aged 28, referred by Dr. T. B. Henderson, Wakefield, Virginia. Family history is negative; no tuberculosis has occurred in any of her immediate family. Usual diseases of childhood, but otherwise has suffered from no illness. She has never been strong and robust. Married two or three years ago, but has no children. Menstruation has always been regular, of normal amount, and accompanied by no unusual symptoms. Present illness began about two and a half years ago. Patient first complained of what she called indefinite attacks of indigestion. At first these attacks were mild, so much so that little attention was paid to them. Later they became more marked occurring at times at quite frequent intervals, and again as much as two or three weeks would intervene between the attacks. Often the attacks were accompanied by a great deal of abdominal pain, nausea, and vomiting, some distension, and as they wore off some pain remained which localized in the right iliac fossa with tenderness in this region; distension, nausea and vomiting disappeared with the subsidence of the attack. Ingestion of food was liable to provoke an attack. Constipation was persistent and marked throughout. Several physicians were consulted, and for a long time the patient was treated in an indefinite way for indigestion. Her attacks grew severer with increasing frequency, and her last physician believing that her appendix was at fault advised that she seek surgical relief. She was consequently admitted to the Memorial Hospital on February 17, 1908. At this time she was free of an attack, and complained only of marked constipation. Upon examination, the patient appeared emaciated and anæmic, was of a slender build, and weighed only 100 pounds. Her heart and lungs were normal, and the liver and spleen showed normal limits. Over the cæcum an indefinite mass could be felt, not fixed but not particularly movable. Temperature normal, pulse a little accelerated. Without further examination, a diagnosis of chronic appendicitis was made and an operation was advised.

Operation. A McBurney or gridiron incision was made, and upon opening the peritoneum, a rather distinct, indurated mass was encountered. It was evident at once that the appendix was not alone at fault, and, in order to deal with the new condition satisfactorily, the incision was enlarged strictly in the

Fig. 1. Photograph of resected cæcum which has been laid open by a section anteriorly along the course of the lumen. The bridge of tissue which appears in the photograph between the two masses is a piece of mesentery. At *A* is a typical tubercular cavity, one half of which is filled with caseous matter. The area indicated by *B* is the greatly narrowed lumen. To the left of the tubercular cavity is the enormously hypertrophied ileum, while at *C* a portion of ascending colon is indicated which is approximately normal. The appendix is behind, and of course does not show up in the photograph.

lines of the original McBurney incision. Upon the severance of some slight adhesions which existed around the mass, the tumor was delivered without much difficulty into the abdominal wound. A thickened, contracted and distorted cæcum was identified in the mass, and at the base of the cæcum the appendix was made out curled upon itself and adherent to the cæcum. Leading into the mass was the ileum, its walls evidently much thickened and hypertrophied; the bowel beyond the cæcum was normal and collapsed. A few mesenteric glands were palpable in the ileocæcal angle. The hard, indurated character of the tumor suggested carcinoma, and this was not excluded entirely at the operation, although the age of the patient was against malignancy. A clamp was applied to the ileum four or five inches from the junction with the cæcum, another to the ascending colon just beyond, and the intermediate mass which included also the glands at the ileocæcal angle was excised. Union between the ends was made by a right-angle suture which pierced the entire gut wall. On account of the ileum being much hypertrophied, an even apposition was easily made. Drainage was placed in the region of the resection which came out through the partially closed McBurney incision.

The patient's convalescence was uneventful. A slight suppuration occurred in the tract of the gauze drain, and a sinus in the fascia persisted for some weeks. Fæcal matter at no time discharged from this sinus. She was discharged from the hospital at the end of three weeks, and a letter just received from her doctor, now several months since the operation, states that she is doing well and that no untoward symptoms have occurred.

Pathological Report. The specimen consists of a cæcum and appendix, a section of ileum and colon, and mesenteric glands in the ileocæcal angle, all of which taken together make a contracted and distorted mass, irregularly cylindrical in shape, and about half the size of a fist. The mass has an indurated feel, its surface is irregular in outline, and is intimately associated with a fibrolipomatous structure which constitutes a part of the mass. The appendix is thickened and hypertrophied, curled upon itself, and is adherent to the base of the cæcum. The mesenteric glands are intimately tied up in the infiltrated mass, and are only slightly palpable. The walls of the ileum are hypertrophied, but are even in thickness and regular in outline; the resected portion of colon is normal. Introducing the finger in either end of the gut with the thumb outside, one discovers a greatly thickened gut wall, especially about the cæcum. The hypertrophy is unequally distributed, at one area the thickness being especially marked and at another only slight. The ileocæcal valve is stenosed, permitting only the entrance of the little finger with difficulty. The lumen of the cæcum is irregular in outline, and is markedly encroached upon by the thickened wall. A section in the course of the resected gut reveals what has already been made out — an irregular hypertrophy of the intestinal wall, a stenosed valve and a lumen encroached upon with a distorted outline. In addition,

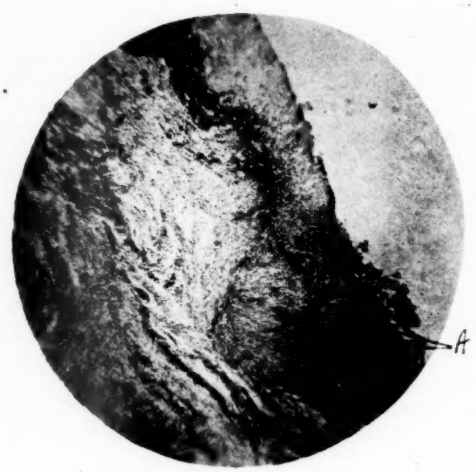

Fig. 2. Section of tissue adjacent to tubercular cavity. *A* indicates two giant-cells which are arranged in masses of epitheloid cells and round-celled infiltration. Zeiss objective aa, ocular 1.

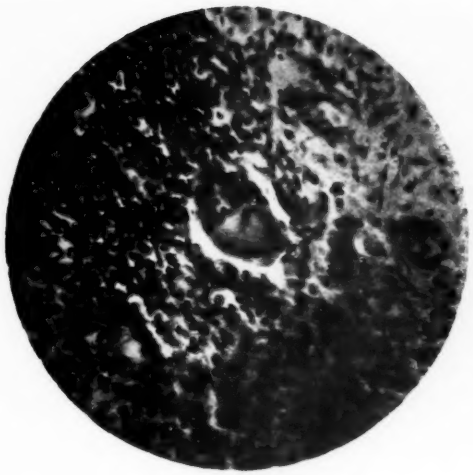

Fig. 3. Area of tubercle (A in Plate 2). Zeiss objective DD, ocular 3.

Fig. 4. Section from ileum adjacent to cæcum showing enormous compensatory muscle hypertrophy. Zeiss objective AA, ocular 1.

section of the cæcal wall at its mesenteric border just above the ileocæcal valve shows a circumscribed cavity two cm. in diameter and filled with a caseous material — a lesion in every way identical with any tubercular cavity elsewhere in the body. (See plate 1. Photograph of gross specimen.)

Microscopically, section 1, taken from contracted gut including mucous membrane and muscle, shows normal glands except in two places where they have disappeared by ulceration; round-celled infiltration was noted between and underneath the glands; fibrous tissue hypertrophied; muscular tissue hypertrophied. Section 2, taken from the border of the cavity which was filled with caseous material, shows many giant cells typically arranged in masses of epitheloid cells and round-celled infiltration. No thickened arteries were noted. Section 3, taken from ileum adjacent to cæcum, shows enormous compensatory muscle hypertrophy.

So far as can be gathered from the literature, there are only 231 authentic cases of hypertrophic tuberculosis of the cæcum on record. This case, consequently, constitutes the 232d case of this rare but most interesting condition.

BIBLIOGRAPHY

1. Conrath. Quoted by Douglas.
2. Hemmeter. Journal American Medical Association, Feb. 29, 1908.
3. Hartmann. British Medical Journal, April 13, 1907, and Revue de Chirurgie, February, 1908.
4. Eisenhardt. Quoted by Boas.
5. Boas. Diseases of the Intestines.
6. Wagener. Abstract in Journal American Medical Association.
7. Fenwick & Dodwell. Quoted by Douglas.
8. Cumston. Annals of Surgery, vol. xlvi.
9. Campiche. Abstract in Journal American Medical Association, April 14, 1906.
10. Koch. Congress on Tuberculosis, London, 1901.
11. Crowder. American Journal of Medical Sciences, vol. cxiv, 1900.
12. Senn. Journal American Medical Association, May 21 and June 4, 1898.
13. Douglas. Surgical Diseases of the Abdomen.
14. Coplin. Manual of Pathology.

TRAUMATIC SUBLUXATION OF THE HEAD OF THE HUMERUS

By RAYMOND RUSS, M. D.
Instructor in Surgery, University of California

THE object of this report is to present a clinical picture which I have seen seven times, to describe in detail one instance of traumatic subluxation of the humerus, and to discuss the many diverse views held in the literature concerning this subject.

These patients have reported from two days to six months after the receipt of a severe trauma to the shoulder joint resulting from a fall. In the early cases considerable swelling was found, but in those in which a period of time had elapsed, the absence of swelling made the examination easy. All these injured shoulders were marked by a bulging of the humeral head, it resting somewhat anteriorly in the glenoid cavity. There was a corresponding flattening of the muscles posteriorly. Where swelling was not present, the natural rotundity of the shoulder was lost and, in three instances, atrophy of the shoulder muscles was well marked. Measurements from the tip of the acromion process to the external condyle were made in every case and compared with the uninjured side. In only two was there any difference,— an increase of one centimeter and one and a quarter centimeters respectively on the affected side. In no instance was the head of the bone pushed up in its socket, or did palpation reveal fracture of the humerus or of any part of the scapula.

Fig. 2. Reflex spasm of left shoulder muscles of long standing in a fracture of the middle third of the humerus.

Fig. 1. Anterior view of the right shoulder joint, showing the relations of the tendon of the long head of the biceps to the musculature. 1. Acromion process. Just beneath it is the tendon of the supraspinatus. 2. Coracoid process. (The tip with its attached muscles has been removed.) 3. Bursa of the subscapularis. 4. Superior transverse ligament of the scapula. 5. Greater tuberosity of the humerus. 6. Lesser tuberosity. 7. Latissimus dorsi. 8. Subscapularis. 9. Pectoralis major. 10. Teres major. 11. Long head of the biceps. 12. Brachialis anticus. 13. Median head of the triceps. 14. Long head of the triceps.

In general, movements were painful and limited, especially abduction. In two old conditions abduction to a right angle could be accomplished, but in others it was decidedly decreased, and in one impossible. Slight inward rotation was twice noted. Flexion was generally quite free although abduction was impossible. In one man, flexion was three-fourths the normal and abduction was nil. When the arm was held by the examiner, it was capable of movement in all directions, although such manipulations gave pain. The increased rotundity of the deltoid on the affected side, when the arms were abducted to

a right angle, was a striking feature in three cases. In no instance was there any evidence of a subdeltoid bursitis or were there signs of the dislocation or rupture of the tendon of the long head of the biceps. None of the joints could be classed as rheumatic, and there was no evidence of other disease in them.

This composite picture has been made because of the confusion which exists in the literature concerning partial dislocation of the humerus, but at this point we come to a most important division of our clinical material. In five of these men reduction had been tried at a prior time by some other surgeon and inquiry elicited the fact in each instance that the lesion had been a subcoracoid luxation. In other words, our clinical picture was here a result of partial reduction, the head of the bone resting to a varying degree in the glenoid cavity. In two cases there was no history of surgical interference, and one of these I will cite later as an example of traumatic subluxation.

It is of interest to state that in every instance of partial reduction, complete reduction was accomplished with disappearance of the deformity and a rapid return to normal function. An anæsthetic was usually given and the Kocher method employed; considerable manipulation was several times necessary. Partial reduction in shoulder dislocations is not generally recognized in the literature. It should not be confused with a condition described thus by Hamilton (1): "I have myself frequently observed, and I have before, when speaking of the prognosis or results of dislocations, called attention to the fact that the head of the humerus sometimes remains for a long time after reduction has been effected, slightly advanced in its socket, so as to lead to a suspicion that it is not properly reduced." I have also observed such instances, but they have not been attended by pain or disability, or does the shoulder admit of further reduction.

A few words as to certain features in the anatomy of the shoulder will not be out of place. The capsular ligament, rising from the margin of the glenoid cavity and extending down to below the tuberosities, is a loose and capacious bag, which in no way aids in holding the head of the humerus in contact with the glenoid cavity. The joint owes its integrity to the capsular muscles, rather than its ligamentous attachments, and atmospheric pressure. The position of the head of the humerus is under the control of these muscles, which spread fan-like from its superior, anterior, and posterior parts; thus we can account for the upward, backward, and forward pull upon the head, but a downward pull is also essential to maintain it in equilibrium. The tendon of the long head of the biceps performs this function, and in this way the biceps may be considered as a capsular muscle. It follows that when the tendon is displaced or ruptured, the head of the bone will rise upwards and forwards, for this is the opposite direction from its pull. This explanation is offered by Soden (2), Gray (3), Paulet (4), Morris (5), and Treves (6). Between the upper surface of the head of the humerus and the lower surface of the acromion there is normally present quite an interval, which is occupied by the capsular ligament and some fibrous tissue. This interval is sometimes greatly increased in paralysis of the deltoid, and Nannoni (7) records a case in which the space was so great as to admit four fingers. Treves (8) and others have pointed out that the head of the humerus rests against a nearly flat surface of bone. The term "glenoid cavity" must be considered as a misnomer.

Rupture of the capsule in shoulder dislocations has been emphasized by all writers. Broca and Hartmann (9), basing their opinion on experiments on the cadaver, believe luxation to be impossible if the capsule remains intact. Manley (10) remarks that he has not been able to find a case of dislocation in the literature in which this has not occurred. But such an instance is mentioned by Eve (11); his patient suffered a subcoracoid dislocation as the result of direct violence, a blow on the upper and outer part of the upper arm, the capsule remaining unruptured. Malgaigne (12) believed that incomplete luxation was produced without capsular tear or with a tear insufficient to let pass the head.

Comparatively little has been written of late years upon luxations of the shoulder, and the literature upon the subject in hand is unsatisfactory. The great opportunities which aseptic surgery has afforded, to delve far into the recesses of the body, have turned attention

away from its outward aspect, with the result that many injuries, which may be of great moment to the patient, have been given little attention. The keen interest, accurate observation, and diagnostic acumen which characterize the writings of Colles, Malgaigne, and Dupuytren have hardly been equalled and certainly not excelled in recent years.

The classification of shoulder dislocations made by Sir Astley Cooper (13) in 1823 precipitated a discussion which lasted many years. To the three classes of luxations at that time accepted he adds a fourth, partial dislocation, and cites two cases which he believes should be classed under that head. His statements are open to considerable doubt, for he says, "I believe this is not a rare accident," and the description which follows is not convincing. This doubt is strengthened to denial by a review of the only dissection which he had seen, for he states that the long head of the biceps had been ruptured, the capsule torn, and the head of the bone was under the coracoid process. In other words he has described a subcoracoid dislocation. Malgaigne (14) stated, as early as 1835, that in some cases the articular surface of the humeral head rested on the anterior edge of the glenoid fossa, and such he termed incomplete.

In the addition of Sir Astley Cooper's work on "Fractures and Dislocations," edited by Bransby Cooper in 1842, (15) a case of John Soden is given in full under the title of "Partial Dislocation Upwards of the Shoulder Joint." Pirrie disposes of it in a similar way, and as this case of Soden has been extensively cited and commented upon, it is given here in some detail.

Soden's (16) patient was a man of fifty-nine years who fell backwards, involuntarily placing the arm behind him and receiving the whole weight of the body upon the right elbow; the elbow, however, received no injury, for the shock was transmitted instantly to the shoulder. "On comparing the joint with its fellow," he states, "now that swelling had subsided, a marked difference was observable between their respective outlines; the injured shoulder was evidently out of drawing but without presenting any glaring deformity. There was a slight flattening on the outer and posterior part of the joint and the head of the bone looked as though it were drawn up higher in the glenoid cavity than it should be. The head of the bone was unduly prominent in front." He adds, "The patient being of a rheumatic habit, inflammatory action of that character was soon established in the joints, so that the peculiar symptoms of the injury were masked by those of general articular inflammation, which added greatly to the man's suffering and materially augmented the difficulty of the diagnosis." This patient came to autopsy from another injury six months later and, on examination of the joint, the accident was found to be a dislocation of the long head of the biceps from its groove. The tendon was entire and lay enclosed in its sheath on the lesser tubercle of the humerus. "The capsule was but slightly ruptured; the joints exhibited extensive traces of inflammation; the synovial membrane was vascular and coated with lymph; recent adhesions were stretched between different parts of its surface, and ulceration had commenced on the cartilage covering the humerus where it came in contact with the under surface of the acromion; the capsule was thickened and adherent." Soden was led to inquire, from the close resemblance of this case to a partial luxation of the humerus, how far a lesion of the tendon would be involved in the production of such a deformity.

South (17) has recorded the history of a patient of fifty-eight years who fell thirty feet from a scaffold. The author states that a depression, below and behind the acromion, led him to suppose that some displacement of the head of the humerus or fracture of the neck of the scapula was present. "I then put my hand on the shoulder, and commenced gentle rotation of the arm, when immediately and unexpectedly I felt the head of the humerus move backwards and the appearance of pit ceased." On moving the elbow the head of the humerus would again slip out and the author noted that this was accompanied by greater prominence and roundness of the front of the shoulder. The death of the patient shortly after permitted South to make a careful examination. He found a fracture of the clavicle and a fracture of the acromion an inch from its extremity; in the latter there was no displacement, as the periosteum was not lacerated. The coracoid process was broken a half inch from the tip and the attached muscles had much displaced it. By moving the head of the humerus about, the roundness in front of the acromion was again produced, the head of the bone being thrown partially forwards over the edge of the glenoid cavity so that it became fixed.

Laugier (18) has published the history of a patient who had suffered a trauma of the shoulder but in which, on account of the swelling, he did not diagnose a subluxation until twelve days after the receipt of the injury. He found beneath the acromion process a slight depression, together with a shortening of the arm to the extent of five or six lines, and a prominence of the head anteriorly. There was difficulty in abducting the humerus, the scapula moving equally with it. He made attempts to reduce the deformity, but they were not successful.

Avrard (19) has observed a similar displacement which was of thirty-one years standing and followed a fall upon the shoulder. The head occupied the space bounded by the coracoid process, the acromion, and the glenoid cavity, and reduction was impossible. There

were eight or ten millimeters shortening. Abduction was checked at thirty degrees, due to the impingement of the great tuberosity upon the acromion process. All the joint movements were restricted.

Malgaigne (20) in commenting upon the observations of Soden, Laugier, and Avrard, believes that they were deceived in assigning a traumatic cause to the affection. He repeats Soden's description of the joint at autopsy and places these findings in italics. He states that he has seen many cases of the same character, and has formulated the conclusion that there has never been a traumatic luxation of the tendon of the biceps except as a complication of fracture or luxation of the joint; there cannot be a traumatic luxation that holds the head at the external side of the coracoid process, but there is a pathological subluxation of the humerus due to articular inflammation and retraction of the ligaments.

Velpeau (21) has published three cases which he believed to be incomplete luxations, but his reports are not convincing. Callaway (22) is of the opinion that the accident which is generally described as a partial forward dislocation is the result of either a rupture or a dislocation of the long head of the biceps. After a discussion of some of the most important cases in the literature, he comes to the conclusion that there are few distinctive signs which would help in the diagnosis. He believes that rupture of the tendon usually takes place in old persons, and that it is a milder accident than dislocation.

Erichsen (23) says, "It appears to me that the only dislocation of the humerus to which the term partial is strictly applicable, is that which has been described by Soden, in which the long tendon of the biceps is displaced from its groove or ruptured, and the head of the bone is thrown upwards and forwards under the coracoid process, but not out of the glenoid cavity." Andrews (24) believes that subluxation of the humerus is a possibility, the traumatic violence ceasing when the head of the bone has traversed incompletely the articular capsule.

Clark (25) has published an instance of partial dislocation of the head of the bone backwards, which Holmes (26) regards as conclusive. Tuffier (27), while practicing on a subject the technique of disarticulation of the shoulder, observed the head of the humerus lodged above its normal position in a depression, which it had formed of the superior part of the glenoid cavity, the fractured acromion, and the internal extremity of the clavicle.

Robert Adams (28) in an article of great interest on "Abnormal Conditions of the Shoulder Joint" states that in chronic rheumatic arthritis of this region, atrophy of the biceps tendon is frequently met with, the result being that the humerus is raised by the deltoid and pressed up against the coraco-acromial vault; that these changes are often described as rupture of the tendon of the biceps, and so long as the tendon of this muscle remains intact, the head of the bone cannot be partially elevated above its normal position, or even drawn inwards or backwards by the muscles attached. He has given the findings at autopsy in a case of rheumatic disease in which there was no history of accident. The head of the humerus was displaced upwards, and the capsular ligament was deficient superiorly; the tendon of the biceps was perfect, but was thrown off the bone inwards. In another instance, almost the same displacement of humeral head and biceps tendon as in Soden's case was found in *both* shoulders, the lesion bearing all the characteristics of a chronic rheumatic arthritis. He states that in this disease the head of the humerus may be displaced entirely from the glenoid cavity, or partially upwards, inwards, or downwards.

Smith (29) in 1853 reviewed the cases of subluxation of the humerus which had been reported up to that time, and attempted to show that they were all due to chronic rheumatic arthritis. Owen (30), by the aid of four dissections, has endeavored to prove that cases which have been recorded as true partial dislocations are the result of disease rather than accident. There are a number of other dissections of humeral subluxations recorded in the literature, and their findings are important, although their etiology is open to doubt. William Hargrave (31) cites an interesting dissection of what he terms a partial dislocation of the shoulder joint. He states that, "When the capsule was opened on the internal aspect, the head of the humerus was seen to be in part

external to the joint and was divided into two unequal portions by a deep groove, extending for the entire length of its head in a perpendicular direction." In the case recorded by Dupuytren (32) there was a false articulation, formed in part by the glenoid cavity and a small portion of the surface of the ribs. The head of the humerus was grooved to receive the anterior edge of the glenoid cavity. Malgaigne (33) has noticed the occasional occurrence of grooves on the humerus after dislocation. He mentions two cases described by Sedillot which are similar to the above. He believes that they are often produced at the time of the accident, by the crushing of the head of the humerus on the border of the glenoid cavity.

Fergusson (34) in his text-book on Surgery makes the following interesting statement: "On a subject I noticed that one shoulder was more prominent than the other and, in the progress of the dissection, the head of the humerus was found lying immediately under the deltoid muscle, in contact with the acromion, and surrounded by a very thin capsule of cellular texture. On raising the head of the bone it was ascertained that the long tendon of the biceps was torn, the under end being adherent in its natural groove, and that in addition, a dislocation of the head of the humerus (forwards in all probability) had been in a manner reduced; but, instead of passing into the capsule, had been thrust between this texture and the deltoid muscle. Only a small portion of the glenoid cavity was visible at its lowermost point, the greater part being covered by the flattened capsule. Doubtless in this case, the original opening in the ligament had been only sufficient to let the head of the bone escape, and not free enough to permit of proper reduction."

In the instance of partial luxation from trauma recorded by Sandifort (35) there existed a new articulating surface made up of the upper portion of the glenoid cavity and the base of the coracoid process. He makes no mention of the state of the capsular ligament or the tendon of the biceps muscle, but states that the head of the humerus was enlarged. Labatt (36) reports the dissection of a partial luxation upwards in a female aged sixty. The head of the humerus was found to be firmly supported against the acromion by the lips of a vertical rent in the capsular ligament, which firmly girdled the neck of the bone. Extensive joint changes were present, but no details of the past history of the subject are given on which to base a diagnosis. T. Holmes (37) has also reported a luxation upwards and inwards, but in this instance the luxation was complete. A similar case is described by Malgaigne (38).

Smee (39) has published the dissection of a partial shoulder dislocation upwards. He says, "The upper part of the great tubercle of the humerus, instead of being used for the attachment of the muscles, was converted into an articular surface. The tendons of the supraspinatus and infraspinatus were torn from the tubercle. The head of the humerus with its articular surface was perfectly healthy and the glenoid cavity was also perfect. The long head of the biceps was found ruptured." He states that the result of this accident shows the influence of the spinati and the long tendon of the biceps on the position of the joint. Canton (40) also examined a luxation of the humerus upwards and laid the cause to the division of the long head of the biceps into four slips.

Treves (41) recognizes the possibility of the dislocation of the tendon of the biceps and believes that it is usually displaced to the inner side. In such instances he adds, "The head of the bone is drawn up under the acromion and is prominent in front, abduction being rendered less free than normal owing to the great tuberosity being sooner brought in contact with the acromion."

Such is the mass of conflicting evidence which has come down to us. The mistake of Sir Astley Cooper, whose authority was universally recognized, led to confusion in the classification of luxations until Malgaigne's work became known. Those who believed in the possibility of traumatic subluxation laid themselves open to attack from the looseness of their descriptions; Morel-Lavelèe (42), in a criticism of Bourguet, has commented on this. Subluxation of the humerus, it will have been seen, is generally admitted, but its traumatic origin is denied. Chronic rheumatic arthritis (which is a vague term as used in the texts and which may cover a number of other lesions) is

given first place in the etiology, and the efforts of Smith to prove that all cases should be thus considered are extreme.

The findings on the dissecting table can be given no weight, because of the absence of case histories. The autopsies reported are not satisfactory. Laugier's case was possibly a traumatic subluxation or a dislocation of the long tendon of the biceps. The histories are quite clear in assigning a displacement upwards and forwards in the latter lesion, and as this is in line with our anatomical knowledge, we may accept it as true.

Paul Müller (43) stated in a paper published in 1894, that in three years he had seen five cases which he classed as subluxations of the humerus. The last case only is given in full, but the statement is made that the others were similar to it. This patient was a girl of seventeen who fell down several steps, striking on the left shoulder. He saw her fourteen days later. Flattening of the left shoulder was clearly seen posteriorly. The upper arm was in inward rotation. The head of the bone was thrown forward to the extent of two centimeters and was close to the acromion process. The deltoid muscle was flabby. Behind the acromion, and also to the outer side, he could press his finger tips deeply without palpating the head of the humerus. Active movements were impossible, and passive movements were very painful. When the subluxation was reduced it immediately recurred.

Müller believes that in these cases subluxation is a secondary condition, and that the trauma produces an irritation of the joint branches of the axillary and suprascapular nerves which leads to a reflex atrophy and paralysis of the deltoid and supraspinatus muscles, and generally also the infraspinatus and teres minor. The head displacement would be due to the unopposed pull of the pectoralis major, the latissimus dorsi, and the subscapularis. Such an explanation involves a remarkable selective action as the result of trauma, but it may be possible. Granting the author's explanation, there would be a strong tendency in this class of cases for subluxation to recur after reduction had been accomplished.

Recently Vale (44) has described a partial luxation of the humerus occurring in a patient who fell from a bicycle on to the outstretched hand. He first saw him seven and a half weeks after the injury. He found some restriction of motion, and that the head of the humerus on the injured side was more prominent anteriorly and on a higher level. This history is very similar to one which I published in 1906 (45) and which I give here in full.

O. A., a muscular German of fifty-two years, while intoxicated on the night of Thanksgiving Day, was jostled and fell to the sidewalk, striking on the left elbow and shoulder. Next morning he had considerable difficulty in putting on his clothes. Since then the right shoulder joint has been painful, but the patient has been able to move his arm fairly well. When he presented himself at the clinic on January 20th, there was great pain on attempting to abduct the humerus above a right angle. The head on the affected side was prominent; there was bulging of the muscles in front and a corresponding depression behind. There was slight atrophy of the deltoid. On palpation the head of the bone was found to rest anteriorly upon the edge of the glenoid cavity. The patient was certain that it had not changed its position since the accident. There were no signs of the displacement or rupture of the long head of the biceps. An anæsthetic was given and forcible movements in all directions were made with a view to breaking up adhesions. I then tried for a half hour to accomplish reduction by Kocher's and other methods but failed.

The patient again reported three days later and I was surprised to find that he had full range of motion on the affected side. He stated that the day after the attempts at reduction were made he suddenly lifted his arm and felt the head of the bone return into its socket. The point of the shoulder was, however, still somewhat prominent and reduction was not complete. Dr. Harry M. Sherman saw the patient and advised massage and light exercise. The patient was seen by me on July 19th. He had been very systematic in his massage and his exercise with light dumb-bells. He had full range of motion and he stated that the joint was much stronger. There was marked crepitation on strong abduction. The humerus was still slightly in advance of its normal position. All movements below height of shoulder gave no pain; movements above height of shoulder gave pain if long continued.

I have not thought that this case merited the title of traumatic subluxation of the humeral head, for I did not see the patient until eight weeks after the receipt of the injury, and while he was a very intelligent man and affirmed that his shoulder had not changed its posiition, I felt that I could not be certain upon this point. The possibility of a spontaneous reduction of a shoulder dislocation has been established by instances in which it has occurred after all

efforts at reduction have failed, by Cooper (46), Boyer (47), and Stimson (48). If complete spontaneous reduction is possible, I have felt that partial spontaneous reduction might have occurred in this instance. The same criticism will apply to Vale's case, for he did not see his patient until seven and a half weeks after the receipt of the injury. A case of Mercer (49) somewhat resembles this and is here quoted.

Mrs. B., aged fifty-six years, was thrown from her carriage seven years before, dislocating her right shoulder. The shoulder was reduced shortly after the accident. When seen by Mercer, motion was limited and she could not raise her arm from her side more than half way to a horizontal position without assistance. Measurement showed no appreciable difference in the size or length of the arm or the size of the shoulder, but the point of the shoulder was prominent in front and flattened behind. "I examined the shoulder in November last and it presented the same general appearance. Some six weeks previous to this examination, in a sudden and thoughtless effort to raise the arm above the head, the muscles unexpectedly obeyed the will, since which time she has had perfect use of it, though the deformity still remains. She thinks that she felt or heard a snap when the arm went up, but it was followed by no pain, soreness, or swelling."

Hamilton (50), in commenting on this case, believes that the deformity was due to displacement of the long head of the biceps, but it is difficult to determine on what grounds he bases his conclusion.

The single instance I have observed of traumatic subluxation of the humeral head is as follows:

A. J., a muscular laborer forty years of age, slipped on the pavement and fell on his left shoulder two days before presenting himself to me. He reported at once to the Harbor Emergency Hospital, where the arm was examined and he was referred to me. The surgeon later told me that there was little swelling, and that no signs of complete dislocation were present. He noticed that the head of the humerus upon the injured side was quite prominent. The patient had always been in robust health and had had no joint trouble of any kind. I was unable to elicit a more detailed account of the accident, with the exception that he had fallen backwards. He had been drinking during the day and his mind was not quite clear as to the way the accident occurred. No ecchymosis was present about the shoulder, and there were no localized points of tenderness, or signs of displacement or rupture of the biceps tendon. The most important feature on the injured side was the prominence of the head of the humerus, it being pressed forward in the glenoid cavity, causing a bulging of the muscles anteriorly. There was a corresponding flattening of the muscles posteriorly as compared with the other side, and the rotundity of the deltoid was slightly less than its fellow. On palpation there was a noticeable depression behind and below the acromion process. There were no signs of inflammation of the subdeltoid bursa. No rotation of the humerus was present. All voluntary movements were painful. The patient could abduct the arm but a slight distance from the body, when pain became very severe and caused him to desist. The arm could be moved forward and backward but slightly, and flexion was painful and limited. Forced abduction was accompanied by spasm of the shoulder muscles, causing the scapula to move with the humerus. The acromio-external-condylar measurements were the same on both sides. The patient stated that there had been great pain in the shoulder for the two nights since the accident. The arm hung helplessly at the side, and he made no attempt to support it.

I believed that I was dealing with a subluxation, and so anæsthetized the patient preparatory to reduction. Complete reduction was accomplished by the Kocher method after a few trials. Before leaving the clinic the patient could abduct his arm to the full extent, but this movement was accompanied by slight pain. The anterior prominence of the head of the bone had disappeared and the muscles posteriorly were no longer flattened but had assumed their normal position. Two days later the patient reported at the clinic. All the movements of the arm were normal and without pain.

There are certain facts in this history which should be emphasized. I regret that I could not obtain fuller details as to the way the accident occurred. It seemed that he had fallen backwards. What the position of his arm was at the time of the accident I was unable to ascertain. We know that in the production of a subcoracoid dislocation the head of the bone must move somewhat downward so as to get below the beak of the coracoid process. Abduction, with or without external rotation, favors such a position, but there are instances where the subcoracoid dislocation has been produced by a sharp blow on the upper and outer part of the shoulder. The most striking features of the injury were the position of the head of the humerus, which was well thrust forward in its socket, and the corresponding flattening of the muscles posteriorly.

This was noted in all seven cases, and varied from a slight displacement noticed on comparison of the injured shoulder with the opposite, to a position of the head on the rim of the glenoid cavity. This latter position was noticed in two cases of partial reduction, and was accompanied by a slight increase in the acromio-external-condylar measurement on the affected side (1 and 1¼ cm.). The head of the

humerus was about a finger's breadth below the acromion process in these cases, and there was a tendency to inward rotation, and supination was very painful. The feature of most importance, in the instance of traumatic subluxation which has been cited, is the fact that reduction was accomplished with comparative ease. All the movements of the shoulder were normal two days later, which would preclude the possibility of tendon rupture.

There are several conditions which may be confused with this, and a brief enumeration of the main features of each will be made.

Sufficient cases have been cited from the literature to show the confusion which has arisen from considering forward displacements of the humeral head in diseased joints as examples of traumatic subluxation. It is necessary that a distinct history of trauma be elicited and the patient be seen sufficiently soon after the injury to nullify the question of partial spontaneous reduction. Where disease of the joint is suspected a Roentgen ray examination will be of great service. The characteristics of complete forward luxation are well understood, and the differences between the complete and incomplete variety have been dwelt upon sufficiently to make them apparent.

Dislocation of the tendon of the long head of the biceps muscle may be confused with this condition. It is marked by the recognition of the empty bicipital groove and palpation of the tendon itself in its abnormal position. Inward rotation of the arm was present in White's case (51) of biceps dislocation, but it was also encountered in two of my cases of partial reduction simulating traumatic subluxation. It has already been pointed out that where the bicipital tendon is atrophied or displaced, the head of the bone is elevated. This has not been noticed by me in subluxation of the humerus nor do I see any reason why it should occur. The other differential features as enumerated by White are so closely in line with those of traumatic subluxation as to be of little value. Thus in his case of dislocation of the tendon of the long head of the biceps there was prominence of the shoulder in front and a flattening behind. He also mentions shortening of the acromio-external-condylar measurement, which is an important point. He lays stress upon the tilting of the acromion with elevation of the arm, the scapula moving with the humerus, but this condition of involuntary reflex spasm is so common as to give it no diagnostic importance. I have seen it in a number of instances of subdeltoid bursitis, and it is often present after simple injury to the muscles about the shoulder joint. I present here a photograph of a patient in whom it persisted for several months following a fracture of the shaft of the humerus.

Rupture of the biceps tendon might possibly be mistaken for traumatic subluxation, but here we have an injury generally due to violent muscular action and followed in most cases by an extensive ecchymosis which appears very soon after the accident; moreover, the contracted belly of the muscle often forms a firm tumor. Hueter (52) gives an important diagnostic point which is also endorsed by Gerster (53). He states that in rupture of the biceps it is impossible to flex the forearm when it is supinated, but that the movement becomes easy when the arm is pronated. The explanation of this action will be found in both Hueter's and Gerster's articles.

Subdeltoid bursitis is so frequently met with that it might be confused with our subject. Codman (54) states that in traumatic cases tenderness is most marked on the great tuberosity just external to the bicipital groove, this point being the most prominent part of the shoulder when the arm is straight. In subdeltoid bursitis there persists in the joint about ten degrees of painless motion. Pain is a constant symptom and, according to Codman, is almost invariably felt in the distribution of the external or internal cutaneous nerve down to the external condyle.

Velpeau (55), in reporting three instances of supposed subluxation of the shoulder, quotes Sedillot as saying that in the case reports of both Laugier and Cooper the signs given are not in accord with the idea of incomplete luxation. These authors, as others who have been mentioned are certainly lacking in accuracy of description, and their failure to effect reduction is worthy of careful thought. While I am not prepared to claim that shoulder conditions which do not admit of reduction should not be classed as subluxations, on the other

hand, success in reducing these deformities is of great weight in establishing the diagnosis.

Argument has not been lacking from those who would show the impossibility of humeral subluxation. Thus Hamilton (56) declares it is an accident extremely improbable if not absolutely impossible, and Panas (57), in his excellent article on shoulder luxations, states that experimentally the luxation seems materially impossible without a total expulsion of the head, while Broca and Hartmann (58) say that they cannot admit of the fixed character of the luxation when the displacement is incomplete. They cannot conceive of the smooth, spherical head of the humerus resting on the glenoid border, for such a contact must be in unstable equilibrium, and can only become fixed by making the dislocation complete. Bennett (59) has advanced a similar argument in his classical description of the fracture which now bears his name. He says, in speaking of the metacarpal-trapezial joint, that a subluxation is here impossible, for the joint is saddle-shaped. "A rider, thrown onto the pommel must, as we know, adopt one of two courses; make his dislocation complete, or get back into his seat." I was much impressed with this argument until I found a case of subluxation at this joint in which there was no room for doubt (60). It is not always possible to apply simple mechanical facts to such a complex structure as the shoulder joint, especially after trauma.

Stimson (61) dismisses the subject of humeral subluxations by stating that the formation of a separate class is unnecessary, and that the difference between the complete and incomplete variety is slight and without practical importance. I cannot agree with this statement, and I believe that the recognition of the condition was of the greatest importance to my patients. A novice has no difficulty in diagnosing a complete luxation. On the other hand, an incomplete luxation may baffle the experienced. If the diagnosis had not been made in the case of traumatic subluxation which I have cited, and reduction accomplished, the patient would have run the gamut of hot applications, electrical treatment, massage, etc., for weeks with little or no improvement, unless Nature had been so kind as to restore the bone to its normal position.

The arguments here given have but amplified the clinical picture which was first drawn. A patient who presents a bulging of the shoulder anteriorly, with a corresponding flattening of the muscles posteriorly, may be suffering from a variety of conditions: a fracture, a simple muscular trauma, a subdeltoid bursitis, effusion into the joint or disease of the joint itself, dislocation of the long head of the biceps or rupture of the biceps tendon, paralysis of certain shoulder muscles, or partial reduction after complete forward dislocation. To these conditions we can add one more,— traumatic subluxation of the head of the humerus.

REFERENCES

1. HAMILTON, F. H. Fractures and Dislocations, Phila., 1875, 613.
2. SODEN, JOHN. Two Cases of Dislocation of the Tendon of the Long Head of the Biceps Humeri from its Groove. Med. Chir., Tr. Lond., 1841, vi, 212.
3. GRAY, HENRY. Anatomy, Da Costa Edition, 1905, 307.
4. PAULET. Traite d'Anatomie Topographique, 678.
5. MORRIS, HENRY. Anatomy of the Joints, 218.
6. TREVES, FREDERICK. Surgical Applied Anatomy, 191.
7. NANNONI's Case in Paulet's Traite d'Anatomie Topographique, 677.
8. TREVES. FREDERICK. Loc. cit.
9. BROCA, A., ET HARTMANN, H. Contribution a l'etude des luxations de l'èpaule. Bull. de la Soc. Anat. de Paris, 1890, 312.
10. MANLEY, THOS. H. Cincinnati Lancet-Clinic, 1899, xlii, 56.
11. EVE, FREDERICK S. Med. Chir., Tr. Lond., 1880, lxiii, 317.
12. MALGAIGNE. Traitè des Fractures et des Luxations, Paris, 1855.
13. COOPER, SIR ASTLEY. Fractures and Dislocations, Lond., 1823.
14. MALGAIGNE. Loc. cit.
15. COOPER, SIR ASTLEY. Bransby Cooper's Edition, Lond., 1842.
16. SODEN. Loc. cit.
17. SOUTH, JOHN F. Case of Fracture of the Coracoid Process of the Scapula with Partial Dislocation of the Humerus Forwards. Med. Chir., Tr. Lond., 1839, xxii, 100.
18. LAUGIER. Archives Generales de Mèdicine, 1834, v, 65.
19. AVRARD. Rev. Med. Chir., 1878, iv, 282.
20. MALGAIGNE. Loc. cit.
21. VELPEAU. Des luxations de l'epaule. Archiv. Gen. de Med., 1837, ii, 269.
22. CALLAWAY, THOMAS. A Dissertation on Dislocation and Fracture of the Shoulder Joint. Lond., 1849, 143.
23. ERICHSEN. Science and Art of Surgery. Phila., 1873, i, 409.
24. ANDREWS, EDMOND. Lesions Traumatiques des Articulations. Encyclop. Internat. de Chir., Paris, 1855, iv, 416.

25. CLARK, LEGROS. St. Thomas's Hosp. Reports, New Series, 1874, v, 145.
26. HOLMES, T. A Treatise on Surgery. Lond., 1875, 248.
27. TUFFIER. Subluxation de la tête humérale en haut avec fracture de l'acromion. Bull. de la Soc. Anat. de Paris, 1886, xi, 292.
28. ADAMS, ROBERT. On Abnormal Conditions of the Shoulder Joint. Todd's Encyclopedia, of Anatomy and Physiology. iv.
29. SMITH, ROBERT W. Observations on Chronic Rheumatic Arthritis of the Shoulder. Dublin Quart. Jour. of Med. Sci., 1853, xv, 1 and 343.
30. OWEN, EDMUND. Lancet, 1875, i, 759.
31. HARGRAVE, WILLIAM. Edinburgh Medical Journal, 1837, ii, 376.
32. DUPUYTREN. Leçons Orales, iii, 105.
33. MALGAIGNE. Loc. cit.
34. FERGUSSON, SIR WM. A System of Practical Surgery. Phila., 1853, 201.
35. SANDIFORT. Museum Anatomicum, iv.
36. LABATT, HAMILTON. A Case of Partial Luxation of the Humerus Upwards. London Med. Gazette, 1837–38, xxii, 20.
37. HOLMES, T. A Case of Dislocation of the Humerus Upwards and Inwards with Fracture of the Coracoid Process of the Scapula. Med. Chir. Tr. Lond. 1858, xli, 447.
38. MALGAIGNE. Loc. cit. ii, 530.
39. SMEE. Dissection of a Partial Dislocation of the Shoulder Upwards. London Lancet, 1845, i, 323.
40. CANTON. London Medical Gazette, 849, viii, 958.
41. TREVES, FREDERICK. Loc. cit.
42. MOREL-LAVELÈE. Bull. de la Soc. de Chir., 1857–58, 490.
43. MÜLLER, PAUL. Die Subluxation des Humerus nach Trauma. Cen. f. Chir., 1894, xxi, 993.
44. VALE, FRANK P. Traumatic Subluxation of the Humerus. Annals of Surgery, 1908, xlvii, 709.
45. RUSS, RAYMOND. Partial Reduction in Dislocations of the Shoulder. Cal. State Jour. of Medicine, 1906, iv, 90.
46. COOPER, SIR ASTLEY. Loc. cit.
47. BOYER, A. Traité complet d'anatomie. Paris, 1815.
48. STIMSON, LEWIS A. Fractures and Dislocations.
49. MERCER, ALFRED. Buffalo Medical Journal, 1859, xiv, 641.
50. HAMILTON, F. H. Loc. cit., 615.
51. WHITE, J. WILLIAM. A Case of Supposed Dislocation of the Tendon of the Long Head of the Biceps Muscle. Am. Jour. Med. Sci., 1884, lxxxvii, 17.
52. HUETER, C. Zur diagnose der verletzungen des M. Biceps Brachii. Archiv. f. Klin. Chir., 1864, v, 321.
53. GERSTER, ARPAD G. Subcutaneous Injuries of the Biceps Brachii. N. Y. Med. Jour., 1878, xxvii, 487.
54. CODMAN, E. A. On Stiff and Painful Shoulders. Bost. M. and S. Jour., 1906, cliv, 613.
55. VELPEAU. Loc. cit.
56. HAMILTON, F. H. Loc. cit.
57. PANAS. Nouv. Dict. de Med. et Chir. prat., Paris, 1870, xiii, 452.
58. BROCA AND HARTMANN. Loc. cit.
59. BENNETT, EDWARD H. On Fracture of the Metacarpal Bone of the Thumb. British Medical Journal, 1886, ii, 12.
60. RUSS, RAYMOND. Bennett's Fracture, Jour. Am. Med. Assn., 1906, xlvi, 1824.
61. STIMSON, LEWIS A. Loc. cit.

DEPARTMENT OF TECHNIQUE

SUBMUCOUS PERINEORRHAPHY FOR COMPLETE AND INCOMPLETE LACERATIONS

By C. A. HALL, M. D., Cleveland, Ohio
Surgeon Wheeling and Lake Erie Railway

In the July number of Surgery, Gynecology, and Obstetrics, there appeared a monograph by Dr. Thomas J. Watkins, describing an original method of perineal repair for complete perineal rupture, in detail somewhat similar to the writer's.

The main difference between these two methods lies principally in the initial incision, in the dissecting out of the transverse perinei muscle and pelvic fascia, which are stitched into the central conjoined tendon, and the elimination of his denudation process for the cure of rectocele.

At the time this paper of Dr. Watkins was being published, the writer's original drawings were in the hands of the artist undergoing completion.

The advantages of the submucous operation are:

1. Simplicity.

2. Removing the field of operation from the greatest source of infection.

3. Decreasing greatly the inconvenience to the patient.

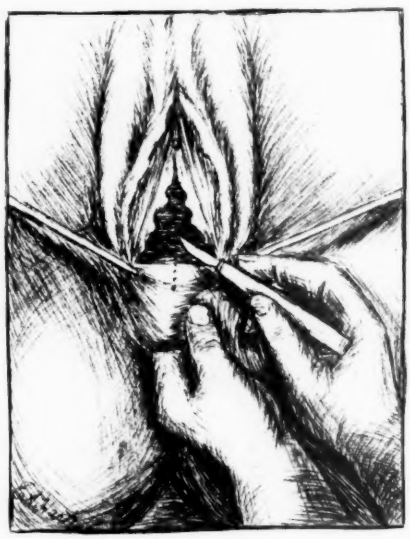

Fig. 1.

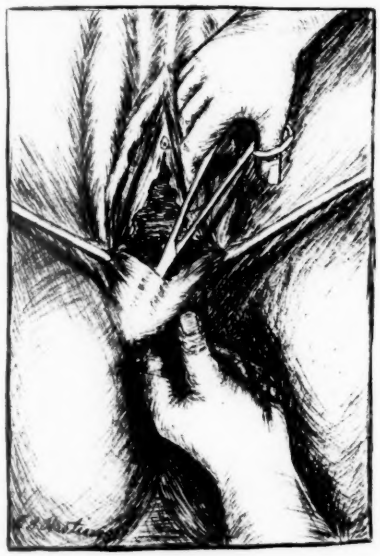

Fig. 2.

4. Rapid recovery, requiring but a short period of invalidism.

5. Eliminating the need of any denudation or flap-splitting procedure by virtue of the tendency of unstriped muscle fiber, of which the vaginal wall is composed, to undergo contraction when relieved of all tension.

6. Because of the few number of stitches required all but two of which are buried and absorbable.

The steps of the operation are as follows:

After preparing the field of operation in the usual manner, the mucous membrane is picked up by means of two Kelly forceps, about one-half inch from the skin border and elevated transversely to the long axis of the vagina as shown in Fig. 1. The membrane is then incised in the median line with a scalpel at a right angle down to the base of the elevated tissue, which, on removal of the forceps, gives an incision about three-fourths of an inch long in the long axis of the vagina through

Fig. 3.

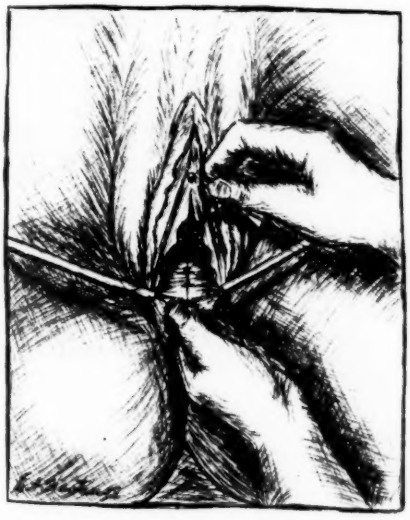

Fig. 5.

which the operation is performed. Fig. 1. The tissues are then retracted as shown in Fig. 2, and by means of a blunt pair of dissecting scissors together with the aid of the left index finger inserted into the rectum as a guide, the tissues are separated down to the retracted ends of the levator ani muscle on either side. The dissection is then carried back to the point at which the divided ends of the transverse perinei muscle lie on both sides. By the use of a tenaculum, the levator muscle is sought out and hooked up through the incision and with it some fibers of the transverse muscle are brought into view. By continued traction and careful dissection, the perinei muscle is isolated, together with fibers of the deep pelvic fascia, as shown in Figs. 3 and 4.

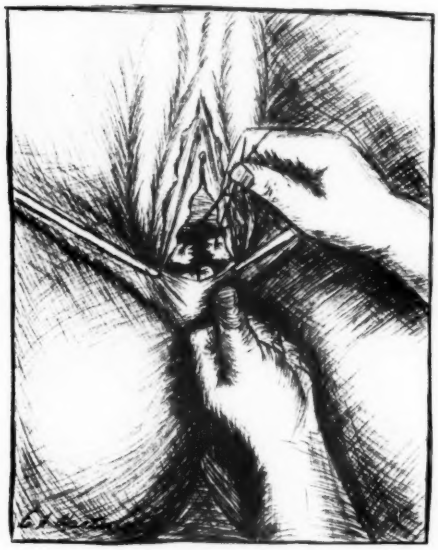

Fig. 4.

The operator now proceeds to bring the transverse muscle into apposition, securing it by means of two No. 2 chromicized catgut sutures into the central conjoined tendon. The anterior fibers of the levator ani are then stitched to the central tendon and the appositional fibers of the levator are united by two No. 2 chromicized catgut sutures, as shown in Fig. 3. The sutures are now cut permitting the muscles to retract into place, and the vaginal mucous membrane is closed by two horsehair stitches in the vagina, completing the operation. See Fig. 5.

The parts are rendered aseptic and the dressings applied. The vaginal stitches retract out of sight when the finger is removed from the rectum, and the parts assume their natural appearance.

This method applies to both complete and incomplete laceration, except in cases when the tear extends too far up the vaginal wall, in which case the foregoing method is preceded by paring the edges of the membrane and bringing them together by means of an Emmett purse string suture.

THE INDICATIONS FOR AND TECHNIQUE OF VAGINAL CÆSAREAN SECTION[1]

By REUBEN PETERSON, M. D.
Professor of Obstetrics and Gynecology, University of Michigan, Ann Arbor

Vaginal Cæsarean section or colpohysterotomy is the application of gynecological principles to obstetric conditions. Stated briefly, the operation is the incision of the anterior and posterior vaginal walls, so as to enable the anterior and posterior cervical lips to be incised in the median line up to but not beyond the anterior and posterior peritoneal reflexions. The purpose of the operation is to rapidly open the cervix wide enough to permit of the equally rapid extraction of the child by version or by forceps.

For years gynecologists have advocated and employed practically the same operation on the non-pregnant uterus. The anterior vaginal wall has been incised longitudinally and transversely, the bladder elevated toward the pubes and the anterior cervical wall incised in the median line up to and beyond the internal os for the removal of submucous fibroids. But until recent years there has been a strange hesitancy on the part of the profession to apply modern surgical principles to obstetric problems. Hence all honor should be accorded Dührssen and Acconci, who independently developed the operation of vaginal Cæsarean section and brought it to the attention of obstetricians. This the former first did in 1895, and up to the present time in many monographs and special articles has urged the advantages of the operation. At first the profession was slow to adopt the new procedure, but since it has been taken up by men like Veit and Bumm, who have at their command large obstetrical services, it has grown more popular, and enough reported cases have accumulated to enable us to judge of the efficiency and after results of the operation.

Up to now the operation has mostly been performed by experts and largely in hospital practice. In several of the recent text-books on obstetrics it is distinctly stated that vaginal Cæsarean section is not an operation for the general practitioner, because of his unfamiliarity with vaginal operations, the necessity of having at hand a number of trained assistants, and the impossibility of securing in private residences aseptic conditions which would insure for mother and child successful results. The same arguments in turn have been used against almost all obstetric surgical procedures, yet experience has shown that if the particular operation under discussion has a true reason for its existence, its technicalities can be acquired by the general practitioner, and that his results are uniformly good.

The practitioner's failures with such obstetric operations as manual dilatation of the pregnant uterus and internal version are due not so much to his unfamiliarity with the technique of these operations, or to his lack of asepsis, as to his failure to familiarize himself with the indications for and contra-indications to these two procedures. I am continually amazed to learn of the brilliant operative work in obstetrics which is being done by men only recently graduated from our medical schools. Instinctively they seem to be able to skillfully apply their knowledge of obstetric surgery, necessarily, except in a few instances, acquired from practice on the manikin. On the other hand, I am equally surprised to see the mistakes which are made by the same class of practitioners through their ignorance of the proper indications for the several obstetric operations.

In this paper I shall consider the indications for this comparatively new procedure, the so-called vaginal Cæsarean section. Then by means of lantern slides I will take up the various steps in the technique of the operation, so that we shall be in a position to determine whether this operation can prove of value to the practitioner in his everyday work.

INDICATIONS FOR VAGINAL CÆSAREAN SECTION

The indications for vaginal Cæsarean section may be divided into groups, the following classification being somewhat modified from that given Dührssen.

The operation is indicated:

1. Where there is some abnormality of the cervix, rigidity of the os and cervix, cicatricial stenosis, carcinoma, et cetera, which renders dilatation by uterine contractions impossible or difficult, and where a clean-cut incision through one or both cervical and uterine walls is safer for the mother than divulsion.

2. Where the mother's life is in danger, and the

[1] Read by invitation October 27, 1908, before the Twelfth Councilor District Medical Society of Indiana, held in Fort Wayne, Indiana.

uterus has to be emptied quickly, but the cervix is rigid and unyielding.

3. When the life of the fœtus is threatened, the cervix is unyielding, and rapid extraction of the fœtus is imperative in order to save its life.

It will be noticed that one indication has been placed in each of the three divisions, namely, rigidity of the cervix. To be sure the degree of cervical rigidity calling for a vaginal Cæsarean section is and always must be relative, dependent upon the personal opinion of the operator. But this is practically true of all data which go to make up the indications for any operation. Still there will be only a few doubtful cases, for in the majority of instances operators will be in perfect accord as to the degree of rigidity present.

Again, the time element must play an important part in deciding for or against vaginal Cæsarean section on the grounds of rigidity of the cervix. A cervix which can be dilated manually in forty-five minutes may not be considered rigid, if during such a prolonged operation neither the maternal nor the fœtal life is in danger. On the other hand such a cervix is rigid for all practical purposes, if, on account of danger to the mother or fœtus the uterus has to be emptied in ten minutes. I think this question of the time required to dilate the cervix by some of the older methods of accouchement forcé is very important and not always fully appreciated in a consideration of the indications for vaginal Cæsarean section.

To take up the indications in detail.

1. Where there is some abnormality of the cervix, rigidity of the os and cervix, cicatricial stenosis, carcinoma, et cetera, which renders dilatation by uterine contractions impossible or difficult, and where a clean-cut incision of one or both cervical lips is safer for the mother than divulsion.

For the purposes of clinical study abnormalities of the cervix under this division may be divided into the following groups:

a. Rigidity of the cervix. Where the cervix which has undergone no pathological changes, as far as can be made out by palpation and inspection, fails to dilate after many hours of labor.

b. New growths of the cervix. Where the cervical abnormality which interferes with proper dilatation is due to a new growth in the cervix, such as carcinoma, fibroma, or tuberculosis.

c. Rigidity due to cicatrices. Where the abnormality is due to cicatrices arising from former operations, such as trachelorrhaphy, amputation of the cervix, operations on the anterior and posterior vaginal walls for complete procedentia, et cetera.

d. Faulty position of the uterus including the cervix. Where the cervix fails to dilate because it is in an abnormal position and is not acted upon by the contracting uterus. Examples of such conditions may be seen where pregnancy follows operations or retrodisplacement of the uterus. (Vaginal fixation, abdominal fixation.)

a. Rigidity of the cervix. Non-dilatability of the cervix may be due to ineffectual pains or to other conditions which are not apparent to the obstetrician. Whatever may be the cause, such cases do exist, as all of you who practice obstetrics know. Conservative and expectant treatment finally fail and something has to be done to help the unfortunate woman who, having labored ineffectually for hours, is worn out by pain and loss of sleep. Such a cervix is hard and unyielding and calls for manual dilatation or vaginal Cæsarean section. The following case may serve as an illustration:

CASE 1. Primipara. Rigidity of the cervix. Latter not taken up after constant labor pains for three days. Anterior colpohysterotomy. Extraction of still-born child. Maternal recovery.

Number 2077, age 18, single, apparently a fairly strong woman, a patient in the University of Michigan Maternity. Labor pains began Sunday, August 3, 1907, the presentation being a breech. From that time until the following Wednesday morning the pains recurred regularly, and while not accomplishing anything as far as dilatation of the cervix was concerned, prevented the patient from sleeping and gradually led to a state of exhaustion with a very much discouraged woman and a gradually rising pulse. Wednesday morning, August 6th, the patient was placed under anæsthesia and carefully examined. Pelvic measurements were normal. The presentation was a breech with membranes unruptured. The cervix was not taken up, the os was rigid, and barely admitted the tip of the finger. Vaginal Cæsarean section. Transverse and longitudinal incisions through mucosa of anterior vaginal wall. Bladder wall pushed upward. Anterior cervical and uterine walls incised in median line for nine centimeters. Both legs brought down and child easily delivered until attempts were made to extract the after coming head. This finally delivered with forceps but child was dead and could not be resuscitated. Perineum torn through into rectum, and was repaired by secondary operation. Mother made a good recovery.

This case illustrates the indication for the operation. In spite of the misfortune of losing the child, I still think the operation performed preferable to manual dilatation. I made the mistake of not sufficiently dilating the vagina prior to the cervical incision. Moreover, with a large child in a primipara at term, it is always best to incise the cervix posteriorly as well as anteriorly.

b. New growths of the cervix.— Carcinoma. It is not the purpose of this paper to quote many statistics, but rather to consider the various phases of our subject in a broad, general way. For this reason I refrain from discussing in detail the admirable statistics collected by Dührssen from his table of 248 cases of vaginal Cæsarean section.

There are a number of points to be considered in dealing with carcinoma of the pregnant uterus. Fortunately such cases are comparatively rare, yet 45 out of the 248 cases of vaginal Cæsarean section collected by Dührssen were for carcinoma of the cervix. In each of these cases the vaginal section was followed by vaginal hysterectomy. Hence it is not improbable that the practitioner will meet with one or more cases of this complication in his practice.

Where the pregnant cervix is the seat of carcinoma it should be incised rather than dilated, for divulsion is a dangerous procedure in friable tissue, a condition which is almost always present in carcinoma of the cervix. Forcible dilatation with the fingers or the metal dilators will almost surely fail to limit lacerations which are liable to extend to the parametrium, or even into the peritoneal cavity. Whenever possible the vaginal Cæsarean section should be followed by a vaginal hysterectomy, not only for the purpose of removing the necrotic tissue from the birth canal, but because this procedure is indicated on behalf of the mother. Because of the bad effect of pregnancy upon a cervical carcinoma, and because of the liability to hæmorrhage or abortion, vaginal Cæsarean section should be performed at once if the condition be discovered before the viability of the child. If the discovery be made later, the case should be treated conservatively and the operation performed as near full term as possible, with the idea of giving the fœtus a better chance.

Carcinoma may serve as a type of the new growths of the cervix which call for vaginal Cæsarean section. When the growth is benign, however, it is a question whether the abdominal Cæsarean operation will not give better results. The choice between the vaginal and abdominal operation will depend largely upon the number, size, and location of the fibroid growths. Conservatism, by retention of the uterus after the vaginal Cæsarean section, is a possibility in benign growths of the uterus, the opposite being the case when the cervix is the seat of malignant disease or of tuberculosis.

c. Rigidity due to cicatrices. It has long been known that cicatricial tissue, the result of cervical lacerations or of the various plastic operations performed for these lacerations or for prolapse of the uterus, is very likely to prove an obstacle to dilatation in some subsequent pregnancy. Only a short time ago, I met with such a case in a woman upon whom three years before I had performed a bilateral trachelorrhaphy. The resistance to dilatation in her case was particularly marked, since in her first two confinements she had only been in labor a few hours, while the third labor was quite prolonged. I did not resort to vaginal Cæsarean section, because there was a steady although slow cervical dilatation and the patient's condition was at no time alarming. Still a very little would have turned the scale in favor of operation. Or in such a case as this, vaginal Cæsarean section will be the operation of choice, for by it the extent of the incisions in the anterior and posterior uterine walls can be limited, whereas, just as in carcinoma, when the cervix is divulsed, either by the hand or by powerful dilating instruments, one can never tell how far a tear will extend.

d. Faulty positions of the uterus, including the cervix. If the resulting fixation of the uterus and cervix, where pregnancy follows vaginal and abdominal operations for uterine displacements, is such that the cervix is within easy reach, vaginal Cæsarean section may be indicated in place of the abdominal Cæsarean. Rühl and Dührssen have each performed vaginal Cæsarean sections for dystocia following vaginal fixation of the uterus. A very similar condition exists in incarceration of the pregnant uterus, where the enlarged fundus is caught and held below the promontory of the sacrum and the cervix is high up and anterior. For this condition, vaginal Cæsarean section is much more indicated than attempts at dilatation and emptying of the distorted uterine canal. Bennecke and Wennerström have both operated successfully for this condition by vaginal Cæsarean section. In the majority of instances of dystocia following abdominal fixation of the uterus, the cervix will be situated too high for a successful vaginal Cæsarean. Such cases are much better treated by the abdominal route. Recently, I reported two cases of dystocia following abdominal operations for the correction of uterine displacements, where the only rational treatment was an abdominal Cæsarean. In each of the cases, the vaginal operations were contraindicated because of the high position of the cervix.

In this connection I desire to place on record a case of vaginal Cæsarean section recently performed by my former undergraduate assistant at the University of Michigan, Dr. C. H. Bailey, who was graduated last June. He was temporarily taking the practice of a physician in a small country town of northern Michigan, and among his first obstetrical cases met with this most interesting case of dystocia, the notes of which he has kindly placed at my disposal. I have gone into these details because I desire to emphasize what can be done successfully in the country by a young practitioner of necessarily limited obstetrical experience.

CASE 2. Dystocia following abdominal operation for prolapse six years before. Unyielding os. Anterior colpohysterotomy. Delivery of eight months' macerated fœtus by internal version. Recovery. Operation performed by Dr. C. H. Bailey.

The patient was a primipara in the eighth month of pregnancy. Six years before she had had some kind of an abdominal operation for prolapse of the uterus. When first seen the patient had been in labor six hours. With each pain the uterus prolapsed, so that the cervix protruded from the vulva. The cervix was hard and unyielding, admitting a small probe with difficulty. After two more hours of ineffectual pains, it was determined after consultation to do a vaginal Cæsarean section, rather than to attempt divulsion of the unyielding cervix. A transverse incision was made in the anterior vaginal wall just above the cervix, and the bladder pushed upward. Anterior cervical and uterine walls cut upward until an opening was made large enough to admit the hand. Podalic version was performed and a partially macerated fœtus removed without difficulty. Abdominal and vaginal incisions closed with catgut. Patient made an uninterrupted recovery. Examination at the end of a month showed that good union of the vaginal wounds had taken place.

2. Where the mother's life is in danger, and the uterus has to be emptied quickly, but the cervix is rigid and unyielding.

The limits of this paper forbid a detailed discussion of all the complications of pregnancy which seriously threaten the life of the mother and may demand immediate delivery. We shall be obliged, therefore, to select the more important complications as examples of the kind of operative treatment the others may call for.

a. Eclampsia. This maternal complication has furnished and probably always will furnish the largest number of cases calling for the employment of vaginal Cæsarean section. This will be true until the time comes when the etiology of the disease or complication is so well understood that prophylaxis will entirely supersede operative treatment. But at the present time the best authorities are agreed that, given a pregnant woman with eclamptic convulsions, the sooner the uterus is emptied, the better it will be for both mother and child. It is also pretty well agreed that that method is best which accomplishes its purposes with the least traumatism and shock to the patient. If these premises are accepted, there can be no further discussion as to the superiority of vaginal Cæsarean section over all other methods, except in rare instances which will be mentioned later. I am not unmindful of the wording of the latter part of the second general indication which I have just read. As I have before stated, cervical rigidity is a relative term. Almost every cervix is hard and unyielding when manual dilatation is compared with vaginal Cæsarean section. I am speaking now of the cases where the obstetrician is called to patients where the convulsions antedate labor pains or start in at the beginning of labor. Later on in labor, when the cervix is softened and is half or three-quarters dilated, manual dilatation is the best method, for practically there will be no resistance to the entering hand. Prior to or in the early stage of labor, it is an entirely different problem. To dilate such a cervix by the manual methods of either Harris or Edgar requires under the most favorable circumstances from a half to three-quarters of an hour, usually longer. From the beginning of the first cut to the extraction of the child, vaginal Cæsarean section does not require more than fifteen minutes.

There is less danger of sepsis in the vaginal Cæsarean operation, for the field of operation can be rendered sterile and as good asepsis maintained as in any vaginal operation. Every one who has performed manual dilatation by one or both hands knows that this is not true as regards these operations, and that there is far more danger of fœcal contamination during the prolonged manipulations than in the much more cleanly, more surgical operation of vaginal Cæsarean section.

Again, with oftentimes a patient on our hands where the convulsions are only controlled by the anæsthetic, the operator feels the need of haste and is apt to use more force in his manual dilatation than is safe. Many patients have succumbed to the shock of extensive tears through the employment of undue force. Even if the tears are not so extensive as to pass upward to and through the peritoneum, they are much more likely to result in sepsis than are the sutured, clean-cut wounds of a vaginal Cæsarean section.

Dilatation by the more powerful instruments, of which the one devised by Bossi is a type, is, in my opinion, entirely unjustifiable because of the accidents which are liable to occur. Without question such an instrument will dilate the cervix. So it would a stone wall if it could be inserted between two stones. Such instruments are unscientific, and should not be employed when we can accomplish the same ends by means of a clean-cut incision.

Cervical incision also will give place to the more scientific, simple and accurate incisions of vaginal Cæsarean section. Because of the time elapsing after making these incisions until the birth of the child, they can not be said to come into competition with the latter operation, when haste is required, as is certainly the case in eclamptic patients.

That vaginal Cæsarean section is looked upon with favor by operators of large experience in eclampsia is seen by the cases reported by individual operators. Bumm has had 37 cases and Veit

33, the latter's series resulting in only one death, a record probably more accidental than otherwise, for a greater percentage of cases of eclampsia than one out of thirty-three are fatal from the start no matter what kind of treatment is instituted.

Vaginal Cæsarean section was performed upon two women who were brought to the University of Michigan Maternity with eclamptic convulsions.

CASE 3. Primipara, eclamptic convulsions, anterior colpohysterotomy. Delivery by forceps. Child premature and lived but a few minutes. Maternal recovery.

Number 1153, primipara, age 20, single, was brought to the hospital, February 5, 1905, in an unconscious condition. She was about six and a half months' pregnant and had had a number of convulsions before entrance, She was markedly œdematous and the urine was loaded with albumen and casts. The vertex presented, the cervix was not taken up, seemed firm and not easily dilatable. Vaginal Cæsarean section was at once performed. Longitudinal and transverse incisions in the mucosa of the anterior vaginal wall. Ten centimeter incision in anterior uterine wall. Membranes ruptured and the child easily extracted by forceps. The child was born alive but was feeble and only lived a short time. There was no repetition of the convulsions and the patient made an uninterrupted convalescence.

This was the first vaginal Cæsarean operation I had ever performed, and I was very favorably impressed with the merits of the operation for the treatment of eclampsia. From my experience with other cases I am sure I could not have dilated this woman's cervix under three-quarters of an hour by manual dilatation, yet the child was extracted within fifteen minutes after making the first incision, and the woman was off the operating table within half an hour.

CASE 4. Multipara. Eclamptic convulsions. Anterior colpohysterotomy. Version. Living child. Maternal recovery.

Number 2217, age 42, married. Has had five children. Was unconscious when brought to the hospital, September 13, 1907. She had had a number of eclamptic convulsions before entrance and had another soon after being placed in the ward. She was near full term but labor had not begun. The cervix was lacerated and somewhat patulous but appeared tense and inelastic. Vaginal Cæsarean section was performed, the technique being the same as in previous case except delivery was accomplished by version instead of by forceps. Child was rather feeble but was living at the time patient left the hospital some four weeks later. There was no return of the convulsions but the urine still contained albumen and casts when patient was discharged.

The operation was entirely satisfactory in this case. Prolongation of anæsthesia and the traumatism of manual dilatation might easily have proved fatal to a woman who probably had chronic nephritis when she became pregnant. The child also might have succumbed to a longer operation.

CASE 5. Multipara. Pregnancy of six and a half months' duration, complicated by acute nephritis. Anterior colpohysterotomy. Dead child delivered by forceps. Maternal recovery.

Number 1984, age 24, married. Patient had had two children. Entered hospital March 16, 1907, suffering from an attack of acute nephritis. She was greatly bloated, had a white, waxy skin and was suffering intensely with pain in the head. The urine was scanty, of a smoky color, and contained much albumen and many casts. No fœtal heart sounds could be made out. Patient was anæsthetized and an attempt made to dilate the cervix. As the latter did not dilate readily, vaginal section was performed with the same technique as in the above cases. Small, dead fœtus readily delivered by forceps. Patient made an uninterrupted convalescence, and a few weeks later left the hospital nearly cured of her nephritis.

CASE 6. Multipara. In the ninth month of pregnancy. Brought to the hospital in eclamptiform convulsions. Anterior colpohysterotomy. Extraction of living child by version. Maternal recovery.

Number 2456, age 26, married. Had had three children and a number of miscarriages. Patient was brought to the hospital in convulsions. Soon after entrance she had a convulsion which was not a typical eclamptic seizure although the tongue was severely bitten. Patient was apparently unconscious so that no history of the case could be obtained as no relatives accompanied her to the hospital. The limbs were œdematous and the urine contained a good-sized trace of albumen and casts. Anterior colpohysterotomy according to technique employed in the other cases. Living child delivered by version. Mother made a good recovery from the operation, but had a number of convulsive seizures during her further stay in the hospital, which were clearly hysterical. A history was also obtained of former hysterical convulsions.

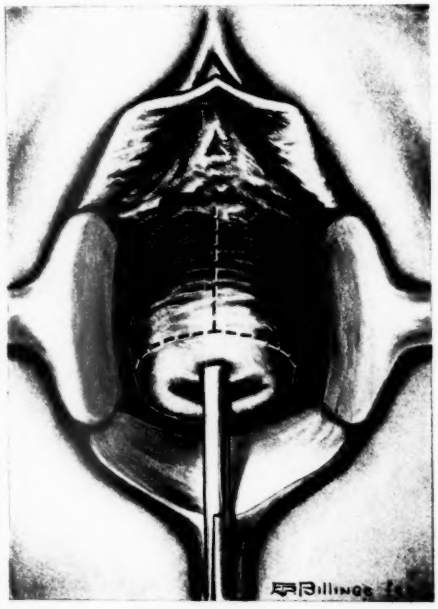

Fig. 1. Cervix drawn forcibly downward by volsella forceps. Longitudinal and transverse incisions in anterior vaginal wall. Lateral retractors used for purposes of illustration. Not necessary for operation.

I do not claim hysteria to be one of the indications for vaginal Cæsarean section. I have simply reported the case here because the operation was performed for convulsions which certainly resembled eclamptic attacks in many particulars. I felt confident that the woman could be delivered safely by the vaginal Cæsarean operation, gave her the benefit of the doubt in diagnosis, and operated.

I am sure that any of you who are confronted with eclampsia and feel that the uterus should be quickly emptied will not go far amiss, if you seriously consider the claims of vaginal Cæsarean section for this class of cases. I shall be surprised if, after a little experience with the operation, you have any inclination to return to the old operation of manual dilatation.

b. Placenta Previa. Not often, I believe, will this dangerous complication of pregnancy call for the performance of vaginal Cæsarean section. A rigid cervix is a rare occurrence in placenta previa, Holmes estimating that it does not occur oftener than once in 606 cases. One can never tell exactly where a placenta is located, and to cut through the sinuses in splitting either the anterior or posterior portions of the lower uterine segment would surely give rise to severe hæmorrhages in the more advanced pregnancies. Those who have had to deal with placenta previa know how the blood pours out of the vagina and how impossible it would be to do any cutting in these cases. I remember one case where, during a mere examination, there was a terrific hæmorrhage, which required vigorous packing before it could be controlled. I should have hated to attempt vaginal Cæsarean section in the presence of such a hæmorrhage.

Fig. 2. Vaginal wall dissected away from bladder wall for short distance on each side of incisions. Bladder dissected from uterus by few strokes with sponge.

Fig. 3. Cervix grasped at each side of median line by Volsella forceps. Cervix split upward in median line by stout scissors. Bladder held up behind pubes by retractor or sponge.

In central implantation of the placenta, abdominal Cæsarean section is a much preferable operation. In the ordinary case of placenta previa the tampon will give the best results. These remarks apply to the later months of pregnancy complicated by placenta previa. A rigid cervix is not uncommon at earlier periods of gestation. Here, in the presence of a rigid cervix and low placental attachment, vaginal Cæsarean section may be indicated. The following case is one in point.

CASE 7. Private hospital case. Primipara, age 18. Low implantation of placenta. Five months' gestation. Severe hæmorrhages. Anterior colpohysterotomy. Removal of fœtus and placenta. Recovery.

A young woman, aged 18, was brought to my hospital in

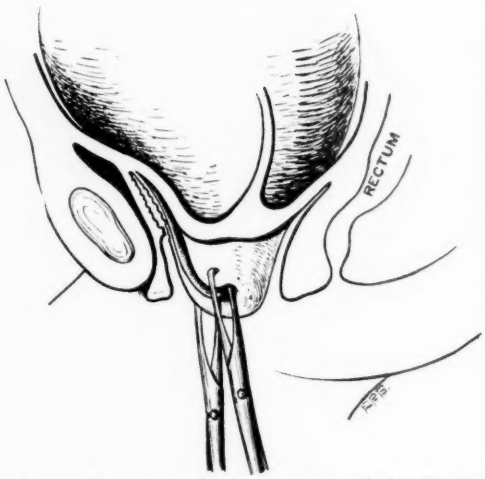

Fig. 4. Profile view showing anterior cervical wall split upward. The incision can be carried upward as far as peritoneal reflexion. Same kind of incision can be made in posterior cervical lip.

June last by her physician, Dr. C. O. Leonard, of Sherwood, Michigan, because of severe uterine bleeding. She was about five months' advanced in pregnancy. She had had three severe flowing spells at ten days' intervals prior to entrance. Each time she had lost a large amount of blood, the flowing being controlled only by tight vaginal packing. Examination showed that the cervix had not been softened by the packings and that the os was small and not at all dilated. After the usual transverse and longitudinal incisions through the anterior vaginal wall and pushing up the bladder, the cervix and uterus was incised anteriorly for about six centimeters. There was considerable but not uncontrollable bleeding from the placenta, which lay close to the internal os and slightly posterior. The placenta and fœtus were quickly removed with the placental forceps, this being followed by contraction of the uterus and cessation of the bleeding.

Space and time forbid the consideration in detail of other maternal complications calling for a rapid emptying of the uterus, nor is it necessary. Diseases of the heart may furnish and have furnished indications for vaginal Cæsarean operation. Whenever the mother's strength is to be spared, it can best be done by a rapid operation, and abdominal Cæsarean section is the only operative procedure which can compete with the one performed through the vagina, and in most instances where the mother is enfeebled by disease, the abdominal route is barred because of the resulting shock.

3. When the life of the fœtus is threatened, the cervix is unyielding, and rapid extraction of the fœtus is imperative in order to save its life.

The time has passed when the fœtus is not supposed to receive any consideration at the hands of the obstetrician. However the latter may feel regarding the relative value of maternal and fœtal life, at least at the present time he is bound to consider the life of the fœtus to a certain extent. Craniotomy on the living child is no longer considered a justifiable operation. Hence I predict that such an operation as we are considering will be called into play more and more in the interests of the child, as the profession becomes more and more familiar with its technique. Fœtal complications, such as prolapsed cord, slowness or irregularity of the fœtal heart beat from prolonged labor or other causes, and other conditions, some of which have been considered under maternal indications, may at any time call for the operation in the interests of the fœtus.

TECHNIQUE OF VAGINAL CÆSAREAN SECTION

In reality the technique of the operation is very simple. In this as in other operations, a number of assistants make the operator's work easier and therefore pleasanter, but they are by no means essential to success. In a hospital one gets into the habit of having a large number of assistants, one at each leg of the patient, one to handle instruments, and one to give the anæsthetic. In private

Fig. 5. Anterior cervical wall split upward. Membranes bulging downward. Through this opening child can be delivered by version or forceps.

practice the physician has become so accustomed to using a leg-holder and handling his own instruments and sutures that he would feel foolish to require more than one assistant beside the anæsthetizer. In country practice oftentimes the anæsthetic has to be intrusted to one of the neighbors in case the operator requires an extra hand. Asepsis can be secured at short notice by the use of rubber gloves. Given then one good assistant, a leg-holder, a kitchen table, and a good light, and the obstetrician is ready to perform the operation.

Preliminary enlargement of the introitus or vagina may be done either by incision or manual dilatation. Even in the case of primiparæ with very rigid parts sufficient dilatation can be secured by passing the hand, the fingers so arranged as to form a cone, slowly through the introitus and gradually dilating the vagina. This procedure is always necessary in a primipara at full term with a fair-sized child. Even in a multipara it is well to see that the parts are well dilated before proceeding with the incision of the cervix.

In case of very rigid soft parts or a very large head, Dührssen's perineo-vaginal incision may be made. This is a six or seven centimeter incision in the right lateral sulcus deep enough to sever the levator ani muscle. It begins just below the orifice of the vulvo-vaginal gland and extends for the distance named downward and outward toward the spine of the ischium. After the completion of the operation, this wound is easily sutured as the last step in the operation. As stated above, this incision is rarely necessary.

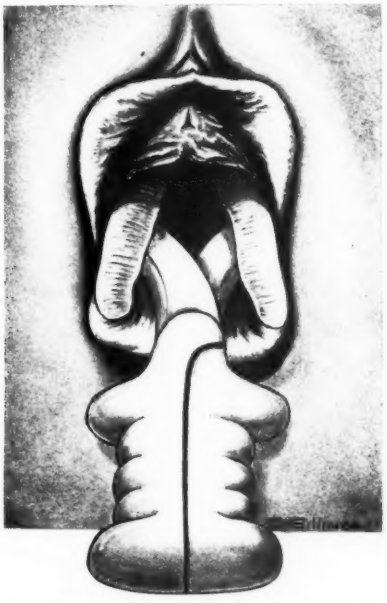

Fig. 6. Showing forceps introduced through incision. It is better to incise posterior cervical wall, than to have opening too small. In most cases version preferable to forceps.

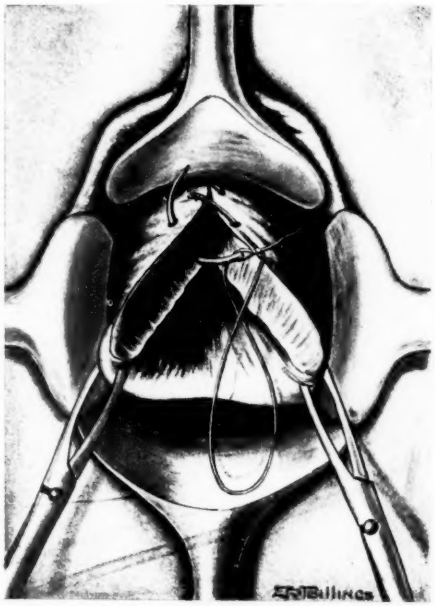

Fig. 7. Incision closed by continuous suture of chromicized catgut. Suture should pass down to, but not through cervical mucosa.

The cervix is now exposed by means of a perineal retractor and the anterior cervical lip drawn downward by the vulsellum. The vaginal mucosa is incised in the median line from two centimeters below the meatus urinarius to the anterior cervical lip. The latter is incised transversely for about five centimeters, thus forming an inverted T-shaped incision. (Fig. 1.)

The vaginal mucosa is now dissected away with a few sweeps of a sponge, the procedure being much easier than in the non-pregnant uterus on account of the looseness of the tissues in the pregnant patient. The bladder is pushed upward and held behind the pubes by the retractor or a sponge. (Fig. 2.)

The cervix is held firmly by a vulsellum at either side of the median line, and the cervix split upward by strong scissors. This procedure will be accompanied by no bleeding so long as care be taken to

Fig. 8. Suture of incision completed.

split the cervix and uterus exactly in the median line. (Fig. 3.)

The bladder is pushed up ahead of the incision in the uterus. The extent of the latter depends upon the period of gestation at which the operation is performed and the corresponding size of the child. Usually at term the incision should be at least nine centimeters. The incision is carried up to but not through the peritoneum. (Fig. 4.) If care be exercised, the membranes need not be punctured but at the conclusion of the incision will bulge downward and appear in plain sight. (Fig. 5.)

In case it seems best to make a posterior incision, the technique is practically the same, except a short transverse incision is made through the vaginal mucosa at the base of the cervix. The posterior cervical lip is split in the median line as far as the internal os or as far as the peritoneal reflexion, the peritoneum being pushed up in advance of the cut.

With the anterior incision alone, or with the two incisions combined, the operator has an opening in the uterus through which it is perfectly easy to pass the hand and arm or to apply the forceps. (Fig. 6.) It must be remembered that it is important to make the opening large enough. The uterus anteriorly and posteriorly can be split upward to the peritoneal reflexions. Usually the operator is too timid and fearful of opening the peritoneum or bladder and makes the incision too small. Then a large after coming head is apt to tear the incised uterine wall laterally, as the head is forcibly dragged through the pelvis.

The delivery of the child should be followed by the delivery of the placenta by the Credé method. If there be no post-partum bleeding the incision or incisions should be sewed up by continuous catgut sutures which should go down to but not through the cervical mucosa. (Fig. 7 and 8.) All that remains is to unite the incised vaginal mucosa loosely by interrupted catgut sutures. (Fig. 9.) A continuous tight suture should not be used here for fear of retention of blood, which is very apt to collect under the mucosal flap, so vascular are the tissues. In some cases it is even advisable to place a small strip of gauze for two or three centimeters under the flap to make doubly sure of good drainage.

In all the cases reported above healing by primary union took place. There is no reason why this should not be the rule, unless sepsis supervenes. A tendency to post-partum hæmorrhage has been reported by some operators, necessitating packing the uterus with gauze. No such bleeding occurred in the seven cases reported above.

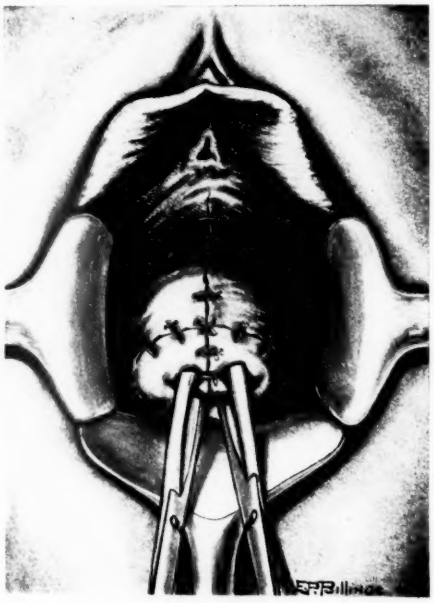

Fig. 9. Vaginal mucosa can be united by continuous or interrupted suture. Care should be taken not to have too accurate coaptation for fear of oozing under flap.

FRACTURE OF THE FEMUR, A METHOD OF SUSPENSION

By H. M. RICHTER, M. D.
Professor of Surgery, Chicago Post-Graduate College; Assistant Professor of Surgery, Northwestern University Medical School

The usual method of securing suspension of the leg in cases of fracture of the femur in infants and children, is to fasten the pulley to a horizontal board supported by upright boards at the head and foot of the bed upon which the patient lies. This method is in common use, and has proved very satisfactory.

The device here described is a rather simple modification that I believe offers sufficient advantages to justify its description.

The apparatus is so constructed that the patient may be placed on a cart and moved to the clinical amphitheatre for class instruction, or to the X-ray laboratory for examination, without disturbing the weights or interrupting the suspension or necessitating moving the entire bed. In either hospital or private practice it makes it easy to lift the patient from one bed to another. Raising one end, or setting the apparatus upon a couple of supports for the more convenient use of the bed pan, and various other minor matters of convenience will suggest themselves.

For an infant or child up to about ten years of age, a Bradford frame, four feet long by twenty inches wide, is made of three-quarter inch gas pipe. In each end, about two inches to either side of the middle line, is placed a "T" supporting an upright gas pipe four feet high, the upper ends of which are connected by a horizontal rod of the same material. Thus the apparatus consists of a Bradford frame, with the horizontal rod fastened to it instead of to the bed. A frame of the size described weighs about twenty-six pounds, and contains less than $1.50 worth of material. The dealer will put it together for little more.

Showing splint resting on two chairs.

The photograph illustrates the manner of applying traction in various directions after the suggestions of Bardenheuer and Graessner in their monograph on the use of extension in the management of fractures.

TROLLEY TREATMENT IN SPONDYLITIS AND LOCOMOTOR ATAXIA

By DR. ALEX. C. WIENER, Chicago, Illinois

The treatment of tubercular spondylitis has grown to be a typical one in uncomplicated cases. Any apparatus may be used which counteracts the spasms of the long muscles of the back and extends the spine in a small degree, and at the same time permits of free locomotion and outdoor exercise. The ideal apparatus is that devised by Hessing. It rests securely upon the crest of the ilium and permits of quick and easy change in the amount of extension. It is true that this apparatus, which is made of steel and cloth, does not, in the strict sense of the word, immobilize the spine. That this cannot be effected without serious injury to free respiration and digestion is now generally conceded. Any apparatus which interferes with these two functions should be rejected. In charity practice we have not yet found any device to supplant the plaster-of-Paris cast in point of cheapness and durability. All substitutes, such as leather, celluloid, and plastic wood, have been found wanting. Still every surgeon realizes that the plaster-of-Paris cast is

only a makeshift, as it invites the very dangers that should be avoided. If not properly applied, it interferes seriously with the functions of the respiratory and digestive organs. Surgeons should therefore carefully consider the technique of administering the plaster-of-Paris cast. It should meet two indications: First, it must create a firm resting-place at the crest of the ileum, and, second, extend the spine as a whole by reaching well up into the arm-pit and elevating the whole shoulder girdle. In former years this cast was applied while the patient was held in horizontal suspension in the Sayre swing. Then Calot came and suspended the patient by the legs. Both positions are necessarily detrimental to the activity of all the abdominal organs. In the Sayre position the small intestine lies in the small pelvis; the constricting bandages of the plaster-of-Paris on setting inevitably compress the abdominal layers, and consequently impede the circulation in the root of the mesentery. In the Calot position, on the other hand, the small intestine falls towards the stomach and the liver. The omentum majus is, too, incapacitated to properly perform its important functions.

In this connection I cannot refrain from referring to the one-sidedness of specialistic effort in surgery. The orthopedic surgeon of the pure type can have no clear conception of the importance of the relative position of the abdominal organs for the discharge of their physiological duties. Only surgeons who perform intraabdominal operations are vividly impressed with the importance of covering the small intestine with omentum at the conclusion of the operation. I simply apply this rule, which is a self-evident one in abdominal work, to a surgical procedure which necessarily greatly influences the functions of the abdominal organs. The patient is placed on a table, with his arms and head resting on a chair, the trunk being declined at an angle of about 35° and free of access in every direction. It is easily seen that any undue pressure upon the abdominal layers and upon the mesentery is thus rendered impossible and that the small intestine occupies a middle position in which the vessels of the mesentery run perpendicular to the aorta and are not exposed to any kinking. Plaster-of-Paris bandages are well modeled to the surface of the pelvis and the shoulder blades. After the cast is well dried, the next day a rubber elastic is applied to the gibbus, which under this uniform pressure grows smaller and smaller in the course of time. With this treatment I have invariably succeeded in restoring to children who refused to walk, enough confidence in themselves to walk immediately on application of the dressing.

The next innovation pertains to those cases difficult to treat on account of the unfortunate position of the tubercular process, i. e., a destruction in the cervical spine and of the upper dorsal vertebræ. Of course, in all those cases the guiding principle of the treatment is extension which aims at the exclusion of muscular spasms, and facilitates free locomotion with the enjoyment of outdoor life.

The brace consists of a leather collar placed around the shoulders, and a ring which includes the base of the skull and the lower jaw. The supporting rod consists of two parts, the first being hollow and resting with a ball and socket joint upon the collar. The second is fastened with a hinge joint to the head ring to a place corresponding to the mastoid process. This upper part fits into the cylinder below, and the patient can himself regulate the degree of extension by means of a screw. This brace is not heavy, cumbersome, nor conspicuous, and is very efficacious. I use it mostly in children.

The gravest problem confronts us in cases of tubercular destruction of the upper dorsal region. Here it is very difficult to apply an extension. The following case was instrumental in developing a new method for handling this class of cases.

Mrs. M. E., 54 years old, 1½ meters in height, afflicted for fifteen years with a tubercular deformity of the first to the fourth dorsal vertebræ, the highest prominence of which corresponded to the second dorsal vertebra. For one year had had pain in back which radiated into shoulders, head, and abdomen. During the last six months the pain had increased to such an extent that the patient was confined to bed.

In consultation with Dr. Peter Latz I saw the case December 6, 1906. The lungs were normal. She suffered from chronic bronchitis and a tormenting cough. Right heart somewhat enlarged, pulse 100; temperature 99.2; edge of liver reached to umbilicus; stomach pendulous; extreme meteorism; lower extremities immovable with the feet in equino position, and œdematous up to half of the leg. Every few minutes there were clonic spasms of the extremities, which caused the patient to scream; these pains were alleviated only by morphine. There was no doubt that the chronic pachymeningitis which accompanies every case of progressive spondylitis had again become active. A transverse meningitis was threatening.

The pains were at once relieved by weight extension applied to the head. At night a 10 pound extension was applied in the customary way; the greater part of the day the patient was placed in an arm-chair and the weight hung onto a pulley suspended from the ceiling. It was now necessary to give the patient active motions. A steel wire was strung through two rooms. Two casings were connected by steel bars at a distance of 28 inches. Each casing contained two pulleys. The upper pulleys run upon the trolley wire.

Above the two lower pulleys a rope is placed. At one end is a comfortable collar, and on the posterior end a counter-weight is fastened. The collar is placed around the patient's neck. In walking a permanent extension is maintained amounting to the weight applied.

On this apparatus the patient was led through the rooms supported on each side, and the dragging legs would be pushed forward by the nurses. At first the patient was literally dragged through the rooms and careful watch had to be kept of the movement of the wheels. In several days the clonic spasms decreased, and the first active motions set in. In four weeks the patient went with large strides through the two rooms with a ten pound weight attached to her head. At the end of four months, i. e., the end of April, the patient could move about alone, and at the end of July could be dismissed fully cured. The most troublesome to treat was the constipation, but exercise in the open air put a stop to it. The chronic bronchitis still persists, and will probably not improve much in this climate. The patient considers herself cured. I visited the patient eight times in all from December to July. A specific anti-tuberculosis treatment was not used.

Tubercular spondylitis may be compared to a fracture of the vertebra slowly produced. Accordingly I would recommend the same treatment from the third week on, in fractures of the spine, whether or not an operation has been performed. The spine should of course be protected from undue motions by a plaster-of-Paris cast. It is obvious that early exercise of the lower extremities prevents much muscular waste, and may ultimately bring about a much speedier recovery than inactivity in bed. The trolley treatment of locomotor ataxia seems to be destined to unify the two excellent methods which tend to a speedier recovery of co-ordination already lost and prevent losing the same. A year ago the trolley treatment of locomotor ataxia was instituted in an intelligent patient who was rapidly losing his co-ordination. To-day he is so much improved that he can travel alone and his gait is almost normal. The severe lancinating pains have entirely ceased, and curiously enough his sexual power, which had been completely lost for two years, has returned.

In a second case which is under treatment, for three months the general condition has been improved and co-ordination is slowly returning.

Neurologists would do well to give the trolley treatment an extensive and patient trial in systemic diseases of the spinal cord.

CLINICAL NOTE ON INTUSSUSCEPTION

By ERNEST A. HALL, L.R.C.P., Ed., Victoria, B. C.

A baby four months and three weeks old, bottle-fed and delicate, received his food at 9:20 a. m. and immediately went to sleep. He did not awake at 12 as usual. At 12:45 the mother heard an unusually sharp cry and found the child pale, with the legs flexed upon the abdomen, and screaming.

I arrived with the family physician, Dr. Helmcken, three-quarters of an hour later. One glance at the patient,— the pale skin, pearly eyes, abdominal attitude, and peculiar, high-pitched, intermittent cry, — gave a picture never to be forgotten. A rectal examination with the little finger gave one drop of bloody mucus. On account of the rigid recti no tumor could be felt. Within half an hour the child was upon the operating table.

Under anæsthesia a mass could be felt in the left iliac region. The whole of the ileum had prolapsed into the cæcum, and the cæcum into the colon as far as the sigmoid flexure. The prolapse being recent there were no adhesions. The first inch of the ileum was bruised and dark for half of the circumference. This was opened, the extravasated blood removed, the bowel emptied, and the incision closed. The child took food in a few hours. Convalescence was normal.

REMARKS

It is evident that the dead line in these cases is marked by delay. In this case we were fortunate to have the intuitive recognition upon the part of the mother that the peculiar, high-pitched, plaintive yet piercing cry, which as an indication of this condition has not received sufficient emphasis, indicated something seriously wrong. The fact that this cry is synchronous with the vermicular action of the bowel should also be noted. Vomiting is not necessarily a prominent factor, and the passage of bloody stools is a symptom usually too late in the history of the case to be of any value. A tumor can rarely be determined under an-

æsthesia. Umbilical and inguinal hernia are not to be overlooked.

Had the whole circumference of the bowel been involved I would have fastened it in the wound and drained it externally until we had determined whether there were sufficient recuperative power in the bowel or not. It would then be a question of restoration to the abdomen or resection, which could be done at a later date when the child had recovered from the shock, since the lower end of the ileum can be drained externally without seriously jeopardizing the nutrition. In cases in which adhesions and gangrene have set in various methods given in the surgical text-books may be tried, but the best method is to bring the whole gangrenous mass outside the abdomen, drain the bowel and wait until shock has passed off. By this means the poisonous retained matter within the bowel is gotten rid of with the least amount of manipulation, and the offending mass is where it can be observed.

REPORT OF A CASE OF HERMAPHRODITISM

By ARTHUR R. CUNNINGHAM, M. D., Spokane, Washington

Case. V. S., schoolgirl, æt. 15 years 5 months, brought to my office Aug. 10, 1908, by her mother to be examined for a suspected rupture.

Present Illness. Last year her mother discovered a swelling in the right inguinal region which she took to be a rupture. She had a truss fitted to the girl which could not be worn constantly on account of the pain and discomfort it caused.

Personal History. Patient had never menstruated, although since Jan. 1908, she had frequent attacks of epistaxis. These attacks would occur with no particular regularity, sometimes once or twice a week, oftentimes with an interval of two months. No constitutional signs of menstruation at any time. She has had the ordinary diseases of childhood, no other sickness.

Family History. Parents both living and well. One aunt (maternal) died at the age of 28 years and had never menstruated. One sister and one brother living and of normal development.

Examination. Patient of distinctly feminine appearance, 5 ft. 5 in. in height, weight 105 lbs., long hair, girlish face, well-developed mammæ, voice feminine. Local examination revealed two glands, one in either inguinal canal, a slightly enlarged clitoris, and labia majora much larger than normal for a girl of her age. In view of these findings it was suggested to make a full examination under ether. On Oct. 13, 1908, ether was administered by Dr. Frank Hinman, who also confirms the following findings: A gland, size and shape of normal testicle, found in each inguinal canal. The left one could be returned into the abdominal cavity, but the right gland could not be thus returned. Each gland could be pushed down into the upper part of the corresponding labium majus. The labia majora were over-developed, the nymphæ were underdeveloped, and just a trace of a hymen. Clitoris about 3 cm. long, urethral orifice in the normal position for a female.

Vagina. 15 cm. long, ending in a narrow funnel-shaped canal with no trace of a cervix.

Uterus. Entirely absent, could feel no trace of it upon very satisfactory bimanual examination.

Ovaries. No trace of ovaries or adnexia, although being a thin subject the entire pelvic cavity could be easily explored with the examining fingers.

While it is barely possible that we failed to discover an undeveloped uterus, still the patient was such a favorable subject for examination on account of her thin abdominal walls that I feel sure that had there been present even rudimentary uterus and adnexia we would have discovered them. This case undoubtedly comes under the classification of *regular androgynoides*, where "the external genitals are of the feminine type and well proportioned; ovaries are replaced by testicles which are found in the abdominal cavity or the inguinal canal. These women (so-called) preserve the feminine appearance throughout life."—Edgar.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

A REGULAR MEETING WAS HELD NOVEMBER 6, 1908, WITH THE PRESIDENT, DR. A. E. HALSTEAD, IN THE CHAIR

A CASE OF POST-OPERATIVE MILIARY TUBERCULOSIS

BY WILLIAM E. MORGAN, M. D.

My object in presenting this record is threefold: 1. To sound a warning to my confrères in handling similar cases; 2. To present, as clearly as I can, the clinical features of a direct bacterial, endocardial blood infection, and its rapid diffusion throughout the entire organism by the vascular channels; and 3. To elicit by open and frank discussion of the paper a thorough criticism and perhaps a confession from some of you of like disastrous accidents which we all should professionally know, but of which it is unnecessary to speak outside of our sanctum.

Has it ever occurred to you how prone we all are in presenting cases to the Society to exhibit our successes, to seek the applause of our brothers for our winning achievements, and to congratulate each other for self-gratification? But how hard-hearted and fear-hearted we are in acknowledging defeat, in telling of our accidents, in confessing to each other in humiliation, sackcloth, and ashes, the disasters of our work. Are we not by so doing stifling our most profitable means of education, and actually robbing ourselves and our patients of the benefits that would be ours and theirs, if the punishments were made as conspicuous as the awards? Here, then, let me confess to an accident of slightest degree in itself, not due to recklessness, ignorance, or lack of pains, but a technical surgical accident nevertheless, which cost the patient his life and caused me untold worry, anxiety, and nightmare, and which has made of me a timid, trembling coward for all time when called upon to operate in similar cases. May I be pardoned for calling my ailment at such times a sort of surgical hysteria? Did you ever have it? And if so, what was the etiology? Please tell us, that we may not fall into the same pit unwittingly.

Mr. D., laborer, foreigner, aged 28, resident of Chicago seven years, being employed most of the time at indoor, coarse, laboring work, of regular habits, abstemious as to alcohol and tobacco, and of excellent health until this illness, presented himself for operation for chronically enlarged cervical glands of large size, which came on rather rapidly six years before; caused some general malaise and disturbance at the time; soon reached the maximum in size; had remained about the same since, and had given him practically no disturbance. These enlargements involved the posterior and anterior chains of both sides, but larger on the left than on the right side, the latter being the most recent in involvement. As he presented himself, I was impressed by his remarkably robust, healthy general condition, a careful physical examination failing to uncover a sign of disease elsewhere. A diagnosis of tuberculous cervical adenitis was reached by exclusion with some hesitation, because of his remarkably healthy general appearance.

I operated by the usual sterotyped method, as outlined by Plummer and Schroeder, first placing a provisional ligature around the very large internal jugular vein an inch above the sterno-clavicular junction. The glands were unusually hard, the periadenoid fascia being intensely tough, old, and entangled, causing the veins to become very tortuous and varicose. As an incident, let me mention that we were all afforded an opportunity of witnessing several cycles of activity in the mid-neck lymph-channel to the thoracic duct, a very interesting performance, and one which is seldom observed. As I stripped the chain from the lowest part of the vein, I noticed lying longitudinally on the muscles exposed by the collapsed vein at its point of provisional ligation, a delicate, translucent envelope of fascia, about an inch long, which gradually grew larger, with a steady flow of opalescent fluid from above, until, when about the size of an ordinary match-stick, it slowly emptied itself from below upward. This emptying was not synchronous with the pulse, was not influenced by respiration, and was not vermicular. Until now, I had always the idea that cardiac suction combined with respiration was the inciting factor in the flow of lymph toward the heart; but I must certainly declare since this observation, that the tides of lymph are drawn on by some other influence. We all observed several cycles, and a full cycle of filling and emptying covered an irregular period of, at least, two or three complete respirations, and seemed to have no relation whatever to either the heart or chest motion.

I have no explanation to offer, but simply note the observation as a statement of physiological fact. I had practically finished my dissection and was reviewing the whole field, seeking for stragglers which had escaped my eye and finger, and had found one below my ligature close behind the sterno-clavicular angle, about the size of a small pea, and proceeded carefully to work it loose with my finger, when there was a sudden welling of blood, a deep inspiration hiss, immediately followed by restless, tumultuous heart and

breath, and the usual chest rasp, and foaming mucus from the mouth and nose, of an air embolism. I immediately stopped the opening in the vein and placed a snap forceps on it, leaving the forceps in situ, and then made a permanent double ligature of the vein above. In three or four moments the heart became quiet, respiration became calm, and I was enabled to finish the operation without further incident, the patient leaving the table in good condition, with a steady pulse of 108, and respirations 22, full and free. When the patient became fully awake he began to howl with agonizing pain in the lowest lateral area of the left chest, and a physical examination showed an area about the size of the palm of the hand, dull on percussion, with no fremitus, and a prolonged hissing expiratory sound. The voice sounds were ragged and of high note, not at all of the bronchial character of a pneumonia, nor were they of the bleating character of a bronchial obstruction or of a cavity in the lung. These physical signs only accompany a collapsed lung, and in this case I could understand the condition in no other way than that there was an infarction of some rather pretentious branch of the pulmonary artery. From this time on, the patient went through all the varied and progressive stages of multiple foci of tubercular infection in his lungs, kidneys, peritoneum, pleura, eyes, brain, and meninges, until on the 22d day after operation he succumbed to basilar meningeal invasion, his temperature recorded in the axilla being from 106–9 during the last 12 hours.

One of the most distressing features of the case, and yet most interesting clinically, was the ocular invasion. Two weeks before death he became blind in one eye, and shortly after that blind in the other, the field of vision first becoming irregular in each instance, and the iris studded with miliary, glistening, gray pearls, which rapidly became diffused and led finally to a complete anterior dull, gray opacity. The pulmonary infarction was followed by local gangrene, and the usual abundant, nauseating, gray-red, intensely offensive discharge. During this pulmonary destruction, his white blood count reached 24,000, but after it was passed, the count went down gradually to 6,000, and remained from 6,000 to 8,000 throughout the rest of his illness. It would require too much time to review all of the clinical and pathological phenomena which presented themselves from day to day in this case; but the picture was complete in detail, and led to the following conclusions; namely, entrance of air and tubercular serum into the vein, and thence directly into the right heart, out through the pulmonary artery into the lung, where it caused immediate infection and infarction of the lung. Here the stasis was so complete as to become a cesspool of unresisted, unprotected tubercular brood-beds, the pulmonary veinules with open mouths constantly drawing up the colonies of bacilli in their most active condition and pouring them into the left heart, thence to be again fired into every portion of the body.

Gentlemen of the Society, do you think that any amount of argument on the part of the physiological experimenter can ever convince me that surgical air embolism is not dangerous? The physiologist has worked on a healthy animal, and with healthy air, and he presents us with the results of his experiments on the healthy organism, while we as surgeons operate on unhealthy individuals, and we must not be blinded to the extent of believing that physiological air embolism is clinical air embolism. As well might one argue that all water is healthy because the chemist tells us that water is hydrogen and oxygen, and is perfectly harmless because he has drunk it and has observed no ill effects.

This is my first personal experience with air embolism in practical surgery. May God forbid that I ever have another.

DISCUSSION

DR. M. L. HARRIS: I am very glad to have heard Dr. Morgan's paper, but cannot relate any parallel cases to the one mentioned by him.

I think he has expressed the proper view concerning the difference between physiologic experiments and his concrete case. He says that one is dealing with simple air, and the other is dealing with infectious matter, which is an entirely different proposition, and readily explains the very disastrous result he relates in his case, and the harmless results in experimental work.

In removing a chain of tubercular glands from the neck, I had a similar experience in so far as the laceration of the veins was concerned, and the air. It was on the right side, and a tear in the vein took place, as near as I could judge, at the junction of the subclavian and the internal jugular. The entrance of air into the vein took place, as manifested by the sound, the heart's action, etc., but it was immediately plugged, and fortunately no bad result was noted. I left a graduated compress on the vein. I could not get down to sew it. The patient recovered without any symptoms whatever from the entrance of the air. That is the only experience I have had in which air has entered the circulation.

DR. ALEXANDER HUGH FERGUSON: As Dr. Morgan said, in the introductory part of his paper, it is well for us occasionally to make confessions for our own relief and for the benefit of others, and while I have not had a similar experience of air embolism on the operating-table, I have had three cases of miliary tuerculosis following operations on the neck for tubercular glands. The patients were in an apparently healthy condition before the operation, so that I could say that they were cases of post-operative military tuberculosis.

The first case occurred many years ago in a little girl with tubercular glands of the neck. I removed the glands from the left side only. Inside of six weeks she developed fever, and in three months' time she was dead from tuberculosis of the lungs. She showed no tuberculosis in any other part of the body.

The next case was a young man, who had tubercular glands of the neck on both sides, and I operated on both sides at one sitting at the Post-

Graduate. He recovered promptly. He returned to the Post-Graduate in two or three months with symptoms of tuberculosis of the lungs. I sent him to California. He went, and remained away about five months, and returned home to die. He gradually got worse. The health of that man was apparently perfect, with the exception of a deformity of the neck. He, too, was about to get married, and wanted this deformity removed. Unfortunately, when I operated on him the tubercle bacilli were very active. That points out the necessity, while operating on these cases, of being careful not to break down the glands. I cannot recall other cases I may have had; but the dangers of miliary tuberculosis following operation for the removal of tubercular glands are not to be slighted.

DR. D. A. K. STEELE: I was particularly interested in the relation of this case by Dr. Morgan, because of its close resemblance to one I had recently, a week ago last Thursday, in all its features, except so far the patient has not developed miliary tuberculosis following a surgical operation.

The patient was 46 years of age, from whom Professor Senn removed all glands on the right side of thc neck six years ago, and she was free from tubercular adenitis until three or four months ago, when the glands on the left side became involved. I made a typical dissection of the left side, removing the glands, noticed they were hard, and had a good deal of periadenitis and extending well down toward the mediastinum beneath the notch. There were two or three nodules away down and in a location where we found an inaccessible gland, apparently the last one. We did not like to leave it, and while fishing that out my attention was arrested by the same ominous hissing sound as Dr. Morgan has described; in drawing up and teasing out the gland, I had ruptured the vein deep down in an inaccessible place. The hissing sound continued. I filled the cavity with normal salt solution, which excluded air promptly, and followed Dr. Harris' method of putting in a conical plug, packing with iodoform gauze, finished the operation, and no ill results followed. The patient left the hospital yesterday perfectly well from the operation. Whether miliary tuberculosis will develop later on, no one can say. It demonstrated to me very forcibly the danger in operating in that cavity, and the sudden entrance of air into the vein, which we regard as serious, but which we should now regard as much more serious since hearing the case reported by Dr. Morgan. I am sure we are all under obligations to him for such a beautiful and lucid discourse on the conditions that obtained in that particular case.

DR. D. W. GRAHAM: I have had no experience with air embolism, except that I was once urgently called to the hospital to see a case that an outside physician had been operating on, and when I arrived the patient was dying. The account he gave was that in removing glands of the neck on the left side, from under the clavicle, there was sudden profuse hæmorrhage, followed by an ominous hissing sound, and struggling on the part of the patient. Artificial respiration and other local measures failed to revive the patient. The vein had been ruptured accidentally, and while attempting to control the hæmorrhage, the hissing sound was first heard. In that case air embolism, I should say, was undoubtedly the cause of death.

DR. E. J. SENN: I wish to say a few words in regard to a case I operated on a few years ago, in which there was no apparent injury done to any of the larger blood vessels, except the smaller vessels which would be ordinarily injured in dissecting tubercular glands of the neck. The case was one of long standing, and the glands were very hard and resistant, so that enucleation was very difficult. The internal jugular vein was not injured. There was no accident at the time of operation; the patient was taken off the table in good condition. From twenty-four to forty-eight hours from the time of the operation the patient was taken with severe pains in the head, high temperature, pulse first fast, then becoming slower, which is so characteristic of cases of basilar meningitis. She had all the symptoms of a tubercular basilar meningitis. While during the operation the glands were very indurated, I do not remember lacerating any of them; but the whole chain of glands was taken out, from the clavicle away up to the mastoid, in one mass. While I have operated on a great many cases, this is the only time I have known of such a disastrous consequence, where the operation had been successfully done.

I am very glad Dr. Morgan has reported this interesting case, for the reason it impresses upon us the importance of not making any promises to patients. We have all lost patients. Some patients want us to promise or guarantee an absolute cure from a radical operation — almost a written guarantee, and this case and others show that even in doing a trivial operation we cannot make any promises; that the patients must take all the chances, and not the surgeon, especially in an operation of the magnitude of an extensive dissection of tubercular glands of the neck. While the physician will do ordinary laparotomies, these extensive glandular cases still come to Chicago, and for good reasons.

DR. MORGAN (closing the discussion): The gentlemen in reporting different cases have not mentioned any case which at all corresponds with this one in showing the progress of air embolism, and that is the reason I took the liberty of presenting this paper before the Society. Assurances from physiological experimenters may perhaps sometimes make us careless, and as I have heard so much and read so much lately as regards the safety of injecting air into veins, without any disastrous consequences, in animal experiments, it seems to me that possibly a case of this kind would make us as surgeons a little more careful than we would be if we considered the danger from air embolism as nil.

The overwhelming suddenness with which this patient was taken with his trouble was the one thing that made me thoroughly believe that in sucking in the air together with more or less of the blood (because the first thing was a gush of blood, perhaps a little clot of it being sucked in by the first inspiration), it was carried directly through the right heart and into the lung, there making a regular brood-bed, from which the bacilli were carried by the most direct method possible into all parts of the body. This man had foci all through his lungs, the first being an infarct of the left side; then he began to show bloody urine, and examination of the urine showed tubercle bacilli in it. Next his pleura became largely involved, no doubt possibly from contact with the infected lung; then he had tubercular peritonitis; and the stools showed more or less involvement of the intestines themselves. The mesenteric glands became quite palpable; then came ocular infection, and lastly the meninges were involved, and finally terminated his life, which occurred in twenty-one days after the operation. This case places me in the position of saying that, no matter what experiments may show upon healthy organisms, we must not be too rash in our operation, and must not look upon air embolism as a slight affair in our surgical work.

UTERINE MYOMA

BY E. C. DUDLEY, M.D.

The patient from whom this specimen was removed last week is a colored woman about forty years of age, married several years, nullipara, who came to my clinic with a diagnosis of uterine myoma. Examination showed the following conditions, which would speak strongly against the diagnosis of uterine myoma:

1. She had not had the usual uterine hæmorrhage which ordinarily goes with myoma, but on the contrary, had had repeated periods of several months each of amenorrhœa, which could not be accounted for by the presence of tuberculosis or other systemic disease. Her menstrual periods did not ordinarily recur oftener than once in six weeks.

2. The uterine canal, measured by the sound, was not more than two and one-half or three-quarters of an inch deep, a very rare condition in uterine myoma. In almost all such cases the canal is much lengthened.

3. On abdominal palpation, the tumor could be moved independently of the uterus. This would indicate that if there was a uterine myoma, it must be rather loosely connected with the uterus by a pedicle.

4. Palpation showed unmistakable fluctuation over a large part of the area of the tumor; in fact, palpation gave the impression of a semisolid ovarian tumor with some fluid portions. Upon opening the abdomen this uterine myoma which I show you was found. It was very adherent to the visceral and parietal peritoneum, so that enucleation was very difficult. There were attached to this growth two sacs containing fluid, one on each side, which proved to be enormously distended Fallopian tubes, one of them the size of a small orange, and the other half as large. The two ovaries adherent to the tubes were normal. The tubes were universally adherent to the visceral and parietal peritoneum by very strong, old adhesions, so that an enormous amount of what might be called gentle violence was necessary to get them out without breaking them. The tubes were first freed from adhesions and brought out without rupture through the abdominal wound. The tumor was then freed and removed by an incision through the upper part of the cervix uteri, the broad ligaments first having been ligated and severed from the growth. These ligaments then were sutured together by end to end approximation, an incision having been made through the anterior wall of the remaining portion of the cervix into the vagina, and a gauze drain having been introduced from above into the vagina. The peritoneum was closed over the broad ligament, and the abdominal wound closed without further drainage.

Here was a case of extensive double hydrosalpinx complicating a rather large myoma, in which large portions of the distended tubes were

adherent to the tumor. I do not recall a case of uterine myoma in which the conditions above described so strongly indicated the diagnosis of an ovarian growth. Of course, the loose connection of the myoma with the uterus accounts for the scanty menstruation and amenorrhœa, and for the normal length of the uterine canal. The difficulties of diagnosis were great and were made greater by the fact that a fluctuating mass was easily apparent. I operated under suspended diagnosis and stated before the operation that I could not make a positive diagnosis. The physician who sent the case to my clinic therefore is to be congratulated upon the correctness of his diagnosis under extreme difficulties. The patient has recovered without complication.

A CASE OF CRURO-SCROTAL HERNIA

By ALEX. HUGH FERGUSON, M. D.

This occurred in a man about forty-seven years of age. The man had had the hernia about thirty years. A truss failed to retain it in place, and at times the pain was so severe that it incapacitated him for all kinds of labor, mental as well as physical. On examination, it was found that the mass in the scrotum was to the outer side of the cord, and that it emerged from the abdominal cavity below Poupart's ligament. No external abdominal ring could be felt. At the operation, it was found that the inguinal canal on the right side (where the hernia was situated) was entirely absent. The hernia passed through the femoral canal into the scrotum. There was a cremaster muscle. The contents of the sac consisted of omentum and a small knuckle of bowel. The herniotomy was completed in the usual manner, and an inguinal canal was made through which the testis and cord were passed after having pushed back into the abdomen through the femoral opening.

The internal oblique muscle in this case was attached throughout the entire length of Poupart's ligament.

DISCUSSION

Dr. E. W. Andrews: I have never seen or read of the exact conditions presented in the case of Dr. Ferguson. The only analogies I could think of are those that go along with ectopic testes and undescended testes, where it is not uncommon for a hernial sac to go down ahead of the undescended testicle, the two conditions being congenital. In these cases the testis sometimes takes an interstitial position. It comes out a certain distance and instead of descending into the scrotum, goes out on the fascia of the abdomen, forming an ordinary interstitial hernia. We have seen cases of perineal location of undescended and undeveloped testes. This, of course, is a congenital anomaly, and like the case just reported, except that undescended testes ordinarily get into the inguinal canal, and not into the femoral canal as in this case.

Dr. A. E. Halstead: In looking up the literature on the subject of dislocated testes, or errors in descent of the testes, I found mentioned testes that had escaped through crural canal, but I have no distinct recollection of having found a hernia associated with improperly descended testes.

SOUTHERN SURGICAL AND GYNECOLOGICAL ASSOCIATION

The Twenty-first Annual Session, Held at the Planters' Hotel, St. Louis, Missouri, December 15, 16, and 17, 1908. The President, Dr. F. W. Parham of New Orleans, Louisiana, in the Chair.

SYPHILITIC HYPERPLASIA OF BONE

Dr. C. E. Caldwell, of Cincinnati, said that this condition was characterized by the deposition, without apparent coincident inflammatory symptoms, of a bony substance from the osteogenetic layer of the periosteum. When occurring in the long bones, particularly in the tibia, it resulted in overgrowth or a species of gigantism of the affected bone. Occurring as it frequently did in the epiphyseal ends of the long bones, it might, through juxtaposition to a joint, be mistaken either for tuberculous epiphysitis, or, as in one case, might closely simulate in its clinical history and appearance a myeloma of the epiphysis. Fortunately, in the Roentgen ray we had a very satisfactory means of differential diagnosis, and we were usually re-

warded with a picture which quite definitely classified the condition. The class of cases to which he referred had usually a remote and not always clearly defined history of syphilitic infection. The progress of the affection was so gradual and accompanied by such slight disturbance of the comfort of the patient that he did not usually present himself for treatment until the bony overgrowth was such as to attract his attention. Inasmuch as the cases which had come under the author's observation had not undergone operation, but had more or less promptly yielded to treatment with iodide of potassium in large doses in a period varying from six weeks to three months, with local inunctions of mercurial ointment, there had been no opportunity for pathologico-histological investigation. Inferentially, from the X-ray pictures, there was a formative osteitis of chronic form, which might not inaptly be compared to the chronic interstitial hyperplasia of internal viscera, and to the syphilitic hyperplasia of the coats of arteries resulting in obliterating endarteritis. It was not at all improbable that in this class of cases there might be nutritive changes in the periosteum which produced a condition not dissimilar to leontiasis or to Paget's disease. In one case affecting the lower end of the tibia the tumor was so circumscribed and had grown so large as to have deceived certain surgeons into the belief of its sarcomatous or myelomatous nature. In this case, a man, aged 34, in whom there were found no stigmata of syphilis, a history was elicted of a sore which had been contracted seventeen years before, although there was no history of secondary trouble. A diagnosis of syphiloma or formative osteoperiostitis was made, and confirmed by the X-ray. Iodide of potassium in large doses cured the patient in three months.

DISCUSSION

Dr. Arthur Dean Bevan, of Chicago, said he had had such an experience as this, that of a man brought to him by a good practitioner with a diagnosis of sarcoma of the thigh, the patient, the father of four or five healthy children, denying absolutely any history of syphilis, and when informed that amputation at the hip joint was necesary, was quite willing to submit to the operation. Fortunately, before doing this extensive operation, massive doses of iodide of potassium were employed for a few months, with entire disappearance of the tumor and then the patient confessed to a syphilitic lesion long before he was married, stating that he had not said so before because he was confident that there could not be any connection beween that initial lesion and his present condition.

MYOMA AND MYOSARCOMA OF STOMACH

Dr. James E. Thompson, of Galveston, Texas, reported one case with the following symptoms: Marked hematemesis and melena; muscular cramps (tetany); no tumor phalpable. Examination of gastric juice showed free HCl, 40; no lactic acid. A partial gastrectomy was performed successfully. The tumor was found to spring from the anterior wall of the stomach, and projected into the interior. Microscopically, it was a pure myoma.

The author reviewed the literature, and found in all 62 cases of myoma and myosarcoma; 19 were operated on, and 43 were found at autopsy, or in different pathological museums. He said the histories of cases were too meager to build up a symptomatology.

DISCUSSION

Dr. Maurice H. Richardson, of Boston, had been unable to tell the difference between a malignant tumor of the pylorus and a chronic ulcer at the time of operation. In these cases the surgeon could not always have at hand an expert microscopist, with freezing apparatus, making sections, etc., to aid him, and yet he must know on the spot what the diagnosis was. If the surgeon could not make a diagnosis he did not know the possibilities of these growths. Every case of the kind reported by the essayist widened a man's horizon and added to his knowledge.

Dr. Charles H. Mayo, of Rochester, Minn., said benign tumors of the stomach were so rare as compared to malignant that they were very seldom thought of; at the same time, there were quite a few of them in which the tumors had been found to be malignant at autopsy. He recalled a case of adenoma of the stomach which was as large as a pear, with a large pedicle, yet not eroded, and not bleeding, which was situated in the poserior wall, projecting into the stomach, and was removed by excision. He also recalled three cases of muscular hypertrophy of the stomach that produced obstructive symptoms. These occurred at the pyloric end, and were similar to those that we know of as occurring in children with muscular hypertrophy, encircling the pyloric end of the stomach, producing starvation and death. The patients were adults, yet the condition was the same, requiring a resection of the stomach as for pyloric tumors.

Dr. George W. Crile, of Cleveland, added a case of myoma of the stomach which was operated on by his associate, Dr. Lower. The case conformed to the one described by the essayist. He reported a case of adenomyoma in his own experience which was situated in the wall of the stomach,

but at the time of operation it was supposed to be a sarcoma. The stomach wall was resected, and the patient recovered.

Dr. Thompson, in closing, thought he was dealing with a malignant growth, and if he had only known it was a benign tumor, a more simple operation would have sufficed.

CONCLUSIONS BASED UPON OBSERVATIONS OF FIVE HUNDRED CASES OF FRACTURE OF THE SKULL

Dr. Walter C. G. Kirchner, of St. Louis, emphasized the study of these cases at the autopsy table and in the operating-room. From a pathological consideration the nutritional changes of brain structure were very important because they served to explain many complications and doubtful cases. The symptoms of various phases of fractured skull were reviewed; also prognosis and treatment.

CONCLUSIONS

Linear fractures of the vault usually did not require operation unless they involved important vessels or sinuses. In depressed fractures the fragments causing depression should be elevated or removed. Experience had shown that in compound fractures, especially where there was injury to the dura or brain, drainage of the wound was usually desirable. Operation for fracture at the base was indicated where hemorrhage was extradural and where there were no signs of compression. The middle fossa was most frequently involved and drainage here could be easily instituted. The practice of examining hematomata by means of exploratory incision was practically without danger, when reasonable precautions were taken, and often gave most valuable information as an aid in diagnosis. The neurological findings were of value in determining focal symptoms, but when complex brain disturbances existed, they might be unreliable as diagnostic aids and required special interpretation. Brain compression was a positive indication for operation, and, as a rule, the sooner compression was removed, the better the prognosis. At operation shock and hemorrhage were factors that should be carefully regarded, and operation should be done as speedily as possible. In doubtful cases, where it was probable that the symptoms were caused by brain compression exploratory operations were indicated. The expectant treatment was to be advocated in those cases in which there were no symptoms of brain compression, in which the temperature and pulse remained nearly normal, and in which the reflexes were but little altered. Unconsciousness in itself was no index of the seriousness of the trouble. Operation was contraindicated in those cases in which the symptoms were the result of intrinsic destruction of brain tissue, when the temperature was high, where the pulse was rapid, and the blood pressure diminished. The importance of a longer period of rest in bed should be strongly emphasized, so that the danger of secondary complications might be avoided.

FRACTURES OF THE ELBOW JOINT

Dr. Robert Carothers, of Cincinnati, selected three points for consideration: (1) The importance of a correct diagnosis; (2) correct apposition and maintenance of the fragments, and (3) early passive motion. A diagnosis was based upon the physical signs present and confirmed by X-ray plates made at right angles to each other of the injured elbow. It was the careful study of the case that counted. The cause of the accident, the age, comparison of the injured with the uninjured elbow, and then an elucidation of any and all the signs of fracture were considered, especially as applied to the location under discussion. After this evidence had been obtained, with a careful study of the X-ray plates, one was able to arrive at a diagnosis which was not only complete, but scientific. Since these injuries occurred with such frequency in childhood, in reading an X-ray plate in such a case one must have in mind the ossifying centers in the immediate neighborhood of the elbow joint, and not be misled thereby. He could not lay enough stress on the X-ray examination of fractured elbow joints, for a diagnosis otherwise made was a guess at best.

The most frequent fractures of the elbow joint were pointed out, and their treatment discussed. In the so-called chisel fractures of the head of the radius the repair was usually with so much callus and impairment of function of the joint that it was advisable, unless for some good reason contraindicated, to remove the broken fragment. In the fractures of the neck of the radius, the best results would be obtained by making apposition which ordinarily was easy by manipulation and maintaining the same with the forearm in a semi-flexed position to overcome a possible displacement of the biceps.

SUPRAPUBIC PROSTATECTOMY

Dr. Arthur Dean Bevan, of Chicago, said that suprapubic enucleation of the prostate had the widest field of usefulness. It was practically applicable to all cases of prostatic hypertrophy, in which a prostatectomy was indicated. It gave full and complete information of not only the prostate, but the bladder and its contents. It did not injure or interfere with the musculature and nerve

supply of the perineum and structures controlling continence. It carried with it little risk of injury to the rectum; it was seldom followed by incontinence, fistula or stricture. The disadvantages claimed against it were greater mortality and necessity of longer residence in hospital. He felt confident that there were fewer complications after the suprapubic than after the perineal operation. This operation was preferable to other methods which had been advocated.

DERMOID CYST OF THE KIDNEY

Dr. William S. Goldsmith, of Atlanta, Ga., said that only two cases of dermoid cyst of the kidney had been reported up to this time, one by Paget, in 1853, and the other by Haeckel, in 1902. The symptoms in the author's case were those of a solid tumor of the kidney, probably the malignant type. It was of slow growth and associated with it were hematuria, pain and tumor. The patient, aged 20, family history negative, at two years of age suffered with pain in the right lumbar region, and at intervals of two or three years was treated for kidney trouble. When sixteen years old, he experienced the beginning of a dull pain in the right side, which progressively increased until two weeks ago, when the pressure and pain radius was compared with that of a heavy watch lying in the abdomen. Four years ago he had attacks of colic, followed by a slight hematuria. These attacks confined him to the house for twenty-four hours, and were relieved by hypodermics of morphia. Recurrences occurred two or three months apart, and for the past two years were characterized by the appearance of a solid tumor, which presented in the right lumbar region. Hematuria and great pain were also accompanying features, and the disappearance of the outline of the tumor was frequently followed by a cessation of the pain. Having witnessed an attack three days before the operation, when the tumor was most manifest, he was convinced that these symptoms were due to a twisted ureter, since the return of the kidney to its normal position practically obliterated the tumor outline. Twenty-four collections of urine showed insignificant deviations from the normal quantity, and microscopic and chemic examinations were negative, except for red blood cells. The patient's weight was normal, and his general condition good. An exploratory operation was advised, and consented to. A lumbar incision was made, which exposed a large semi-solid tumor of the upper pole of the kidney. Efforts to deliver the kidney resulted in a rupture of the tumor, and a quantity of red, granular material was scooped out with the fingers. Nephrectomy was quickly performed, and recovery was prompt and uneventful. A pathologist pronounced the tumor to be a dermoid cyst.

STONE IN THE KIDNEY

Dr. Maurice H. Richardson, of Boston, said that operation for stone in the kidney and ureter were becoming of greater frequency and importance. In early and difficult cases the diagnosis rested upon a history of pain in some of its forms, usually without confirmation by the X-ray, by cystoscopy or ureteral catheterization, by the touch, or by marked signs in the urine. The history in such cases, as in many gall-stone cases, gave the only clue; hence we should study with renewed care the history of stones demonstrated in kidney or ureter, just as we did the history of stones demonstrated in the gall-bladder. The indications for operation were hopeless ampaction of a stone in the ureter; in the kidney the mere presence of a stone. The contraindications were a local pathology which either forbade operation or made it so dangerous or so uncertain that the patient had much to lose and little to gain. The great operative danger in nephrotomy, as well as nephrectomy, was hemorrhage; and when this was from the renal artery or vein or vena cava, easy and instant accessibility was essential to avert death on the table; hence the anterolateral approach was the best. Nephrectomy was unjustifiable unless the changes in the kidney demanded it, especially when the remaining kidney was so likely to contain the nuclei of stones. Before a nephrectomy was done, the remaining kidney should be very carefully palpated by the hands. As a stone may be overlooked, so may tuberculosis or other infections.

DISCUSSION

Dr. G. E. Gavin, Mobile, Alabama: I believe the formation of stone is always preceded by infection of the pelvis of the kidney, and while the source of that infection may be the bladder, it is most often from the colon. I have not been able to rely on the X-ray as an aid to diagnosis as much as I have on the history of the patient. As to the manner of removing the stone, I prefer to do so through the convex part of the kidney. I almost lift the kidney upon the back, place a rubber tube around the pelvis, control hemorrhage thoroughly, make a longitudinal incision, and with very little blood lost one can deliver the stone.

Dr. Charles P. Noble, Philadelphia: I agree with Dr. Richardson that a well-studied history in these stone cases is the best guide to a diagnosis. I recall the case of a patient upon whom I

did a nephrectomy for stone in which the kidney was destroyed because a small stone had obstructed the ureter and produced disseminated abscesses in the kidney. That patient had been in the hands of a professor of therapeutics, who had treated the patient for three years for gout and had failed to appreciate the importance of a careful study of the urinary organs by modern methods.

Dr. Bransford Lewis, St, Louis: The history of the case, cystoscopy, and ureteral catheterization are the means *par excellence* for making a diagnosis of stone in the kidney, but I would not rely on any one of them, preferring to place my reliance on the testimony supplied by all three.

Dr. F. W. Parham, New Orleans: I have been impressed with the remarkable absence of pain and other subjective symptoms in a case in which there was a large stone in the kidney. Three years ago I operated on a woman for large encysted stone in the pelvis of the kidney, running up into the calices, and through a large L-shaped incision the stone was removed. This woman had scarcely any pain; but she passed pus in the urine.

Dr. Arthur Dean Bevan, Chicago: In our clinic we have done a good deal of kidney stone work, and I have been much impressed with this fact in connection with it. It is a branch of surgical work which cannot be done properly by any one man. Good kidney stone work demands, first, a good surgeon; second, an expert in the use of the X-ray; the X-ray, when properly used, gives much less than ten per cent of error; third, an expert in cystoscopic examination, and one who can with the least discomfort to the patient, catheterize the ureters. Fourth, an expert laboratory man to make careful analyses of the urine.

Dr. Stuart McGuire, Richmond, Va.: Three cases have occurred in my practice which illustrate the importance of having the combined opinion of four different observers, namely, the surgeon, the pathologist, cystoscopist, and the X-ray man. A recital of the history of one case will do for all. The patient came with a set of symptoms which were indicative of appendicitis or equally so of stone in the right ureter. So far as the pain and the history of the attacks went, it might have been either. In all three cases there was a large quantity of blood and pus in the urine. The ureters were catheterized, the left side being found normal in each case. The right side was found to contain blood, pus, and cells from the ureter. Up to this point the evidence seemed to be in favor of ureteral calculus. An X-ray was made, and in every instance with a negative result. Therefore, the operation for appendicitis was performed, the appendix exposed without disturbing its position, and in each instance a large, angry appendix was found adherent along the line of the right ureter. Evidently the inflammation originating primarily in the appendix had extended by continuity of tissue to the ureter, causing ureteritis. Within a week after the appendectomy the urine was clear, and no subsequent trouble followed.

CONSERVATIVE SURGERY, THEN AND NOW

Dr. F. W. Parham, the President, selected this title for his presidential address. The aggressive surgeon, who always felt sure he was right, then went ahead, would do well to temper the enthusiasm born of the present brilliant achievement of surgery by giving reverent heed to the admonitions of the past. In renal surgery conservative and radical surgery displayed most conspicuously their coincidence. Here results demonstrated that often the most conservative treatment was also the most radical. The glory of the present-day surgery rested primarily upon more accurate diagnosis, but the refinements of scientific investigation must always be subjected to the criticism of common sense. It was becoming more and more characteristic of the modern surgeon, that whilst recognizing the value of data furnished him by the laboratory, he would relentlessly subject them all to the test of reason and would only decide upon his surgical therapeusis when, after a thorough study of all the facts he had obtained a true perspective of the case

APPENDICOSTOMY IN PERNICIOUS ANEMIA

Dr. L. E. Burch, of Nashville, reported this case, the patient being a negro, forty-five years of age. He concluded by saying that all cases should have the stools examined, in order to determine the presence of infection by the bacillus capsulatus aerogenes. If these bacteria were present in great numbers, then high irrigation, combined with arsenic internally, should be used, and if the patient failed to improve, the appendix offered the best route for thorough irrigation.

DISCUSSION

Dr. H. S. McLean, of Richmond, Va., said that twenty months ago he operated on a case similar to the one narrated by the essayist. The man had been ill for years. He was brought to him with an acute attack of catarrhal appendicitis, and the history disclosed anemia, continued weakness, and bowel trouble. He performed appendicostomy. He had been living on zwieback, buttermilk, and the like, for years, but six weeks

after operation the red blood count was over four million. He soon gained fifteen pounds, went to Europe, and was now in excellent health.

PORRO-CESAREAN SECTION

Dr. F. D. SMYTHE, of Memphis, reported a case in which he did this operation, and gave his reasons for doing so. The rapidity with which the Porro could be performed increased the chances of the patient surviving the operation. The remaining ovary was cystic and, in all probability, a cyst of the same character as the large one removed. The patient was in a condition too much weakened to be subjected to any avoidable risk of the puerperium, hence the Porro. There would always occur cases demanding Cesarean section in the interest of the child and mother. In elective cases there should be no infant mortality attending either operation; hence the surgeon should select the operation that subjected the mother to the least risk of losing her life. The author was fully convinced that the Porro operation was the safer, and that the surgeon performing the Sanger operation in an honest effort to preserve the reproductive organs, would have occasion to congratulate himself now and then on the result of his efforts in that plausible undertaking, but he could not escape the responsibility of the loss of a mother at times, due to his plan of management, whose life could have been saved had the simpler and safer operation been selected at the outset. Until he was convinced that the so-called conservative operation was as safe to the mother as the Porro, it would be his practice to choose the latter.

ELECTIVE CESAREAN SECTION

DR. MILES. F. PORTER, of Fort Wayne, Indiana, discussed Cesarean section as an operation of choice, especially in such case as were usually delivered by so-called minor operations or by unaided natural forces after long labor. Summarizing the reports of 126 elective Cesarean sections collected by personal correspondence, the maternal mortality was found to be 1.58 per cent; the fetal mortality, 0; the maternal morbidity, 12.69 per cent; the fetal morbidity, 0; It should not be forgotten that the fetal morbidity following forceps, etc., was often worse than death. The results of these cases were in accord with the opinions of many men of experience. No method of delivery entailed so little risk to the child as did Cesarean section. Remote ulterior results of Cesarean section, including hernia, rupture of the uterus, and adhesions, could be prevented by proper technic so nearly completely as to render the dangers arising therefrom practically *nil*. Barring infection, some hours of labor did not increase the danger from Cesarean section. The obstetric operations no less than Cesarean section required surgical skill and judgment; indeed, the inherent difficulties of the former were perhaps the greater, and no one, unless he possessed both skill and judgment, should undertake either. In contracted pelvis Cesarean section should be the operation of choice in many multiparae and practically all primiparae. In placenta previa with a viable child Cesarean section should be the operation of choice. In eclampsia in the primipara, with a viable child, Cesarean section was the best method of delivery usually. With capacious pelvis and vagina, Duhrssen's operation might be preferred. Abdominal section for uterine or ovarian tumors done at term should be followed by delivery of the child by Cesarean section. Given an elderly primipara at term with a vigorous child, with a normal pelvis, but rigid soft parts, usually sensitive to pain and physically below par, Cesarean section offered both mother and child a better chance of life and health than the so-called conservative operations.

DR. E. GUSTAV ZINKE, Cincinnati: If I were to make any criticism on Dr. Smythe's paper, it would be that Cesarean section, and especially a Porro operation, under the circumstances, was unnecessary, and in so saying I do not wish to be understood as reflecting upon his ability or judgment. As I understood the case, there was an ample pelvis. The only pathological condition was the presence of a large ovarian tumor on one side, and a small one on the other. The large one was removed without difficulty, and the second one could likewise have been removed, the the abdomen closed, and the woman allowed to take care of pregnancy herself.

As to Dr. Porter's paper, judging from recent literature, Cesarean section will soon cease to be an elective operation, and will only be performed when there are positive indications.

DR. HENRY T. BYFORD, Chicago: It is rather radical to recommend Cesarean section in old primiparae. I have no doubt there are exceptional cases in which this operation might be done; but obstetrics is improving, and a good obstetrician, by using the various means we have at our command, can almost rule out Cesarean section in that class of cases. It is only in the exceptional cases we should resort to such an operation.

DR. CHARLES P. NOBLE, Philadelphia: I am heartily in sympathy with that part of the paper which speaks of broadening the field of Cesarean section. The question is, which is the more

dangerous to the child, an elective Cesarean section, or a very difficult forceps operation? Surely, anyone who has had considerable experience in obstetrics, and who knows the great difficulty attending deliveries either by forceps or version under ordinary conditions existing in private practice, as well as what can be done by abdominal surgery under favorable conditions, must be driven to the conclusion, even on a priori grounds, that Cesarean section is much safer. The mortality to the mother approaches zero, and about one hundred per cent of the children are delivered alive by Cesarean section.

DR. MAURICE H. RICHARDSON, Boston: As to the removal of fibroid tumors complicating pregnancy, unless they interfere seriously with normal confinement, I would not operate, and the results from non-interference are, in my experience, very good indeed. Nature is very kind in the delivery of a child from a uterus which contains fibroids.

DR. CHARLES H. MAYO, Rochester, Minn.: I recall two cases of tumors complicating pregancy in which an elective Cesarean section was planned, but in both instances by manipulation the tumors were lifted out of the pelvis and the women went on to term and were delivered normally.

DR. RUFUS B. HALL, Cincinnati: A woman, forty years of age, pregnant and about to be delivered, came to me with an acute trouble in the abdomen. There was a gallon or more of fluid in her abdomen. She had been ill two days. I operated on her as soon as she came in. I found an ovarian tumor about the size of a cocoanut, with twisted pedicle. I removed this tumor, but did not interfere with pregnancy. She recovered nicely from this operation. On the thirteenth day thereafter she was delivered of a baby, and made a smooth convalescence.

DR. CHARLES L. BONFIELD, Cincinnati: In reference to the difference between a Porro operation and a Cesarean section, I have done but one Cesarean section myself, but had the pleasure of a assisting Dr. Zinke in doing another, and in both instances I was impressed with the exceeding ease of the operation. It is one of the simplest operations in abdominal surgery, gives rise to the least trouble, and in healthy women I would not expect the mortality of more than one per cent. When the uterus is infected, however, a Porro operation is the operation, but when the uterus is healthy, I see no reason for resorting to a Porro instead of the ordinary Cesarean section.

DR. WILLIAM D. HAGGARD, Nashville: There is one conclusion Dr. Porter arrived at in which we can heartily concur, namely, the wisdom of resorting to elective Cesarean section in cases of eclampsia at term, but not in labor. I have had occasion to do this operation twice in the last year in women of this class, who had been having a number of convulsions, one for eight hours, and one for nine hours, both being in a comatose condition before they had the convulsions. Both were delivered by Cesarean section, and both mothers and both children are alive.

DR. WALTER C. G. KIRCHNER, St. Louis: As to the kind way in which nature takes care of these cases, I recall one in which pregnancy was complicated by a cyst. The cyst was removed, and the patient recovered from this operation. A few months later she developed perforative appendicitis, was operated on for that condition, recovered, and went on and was delivered of a healthy child.

DR. M. C. MCGANNON, Nashville: I am in accord with what has been said relative to broadening the field for Cesarean section, for the reason that it is probably one of the simplest operations in the hands of an expert we have to do inside the abdomen. The mortality rate is practically *nil* so far as the mother is concerned, and it gives the child, under all circumstances, the best chance for its life.

NECESSITY OF A SECOND OPERATION FOR THE REMOVAL OF THE APPENDIX IN CASES WHERE AN APPENDICEAL ABSCESS HAS BEEN TREATED BY SIMPLE INCISION AND DRAINAGE

DR. STUART MCGUIRE, of Richmond, Va., supplemented a paper read by him in November, 1907, in which he discussed the necessity of a second operation for the removal of the appendix after simple incision and drainage of an appendiceal abscess. Among the cases reported in the former paper, there were 23 cases of appendiceal abscess of the class adherent to the parietal peritoneum. In this group the treatment had been simple incision and drainage, no effort being made to locate or remove the diseased appendix. In every instance the patients were told that the operation was not for appendicitis, but for an abscess which was the result of appendicitis, and that the appendix had not been removed.

To reach conclusions, two methods of investigation were followed; first, the opinions and practices of a number of eminent surgeons were obtained, and, second, the twenty-three patients whose cases were reported were written to and their subsequent histories ascertained. Dr. McGuire quoted the opinions of the twenty-six surgeons responding to the inquiry, and from the two lines of investigation drew the following conclusions: While a surgeon might be justified in

advising a secondary operation in all cases as theoretically the safest plan to follow, he was not justified in persuading, urging, or starving a patient until he consented to have it done. The appendix should always be removed at the first operation, if the abscess was small, and not adherent to the abdominal wall beneath the incision. It should be left only in neglected cases, where the abscess was large and attached to the parietal peritoneum. When this condition existed, the appendix was usually gangrenous, underwent liquefaction, and was eliminated with the discharges. In such cases suppuration continued, as a rule, for several weeks, and before a secondary operation could safely be done, the patient was homesick, weakened physically by confinement, and depleted financially by the expenses incident to his stay in the hospital. Experience showed that if subsequent trouble developed, the infection was not usually acute, and pus, if it was formed, was walled in by old adhesions. Therefore, the surgeon did his duty if he made it clear to the patient that, owing to the complications which existed, it was not found safe to remove the appendix, and told him that while a second operation was advisable, it was not imperative unless he had tenderness over the incision, colicky pains in the bowels, or persistent digestive disturbances, in any of which instances it was distinctly necessary for him to seek promptly surgical assistance.

RESECTION OF THE BOWEL, WITH A REPORT OF ELEVEN CASES

Dr. J. Shelton Horsley, of Richmond, Va.

This paper will appear in Surgery, Gynecology and Obstetrics.

OBSTRUCTION OF THE BOWELS

Dr. T. C. Witherspoon, of Butte, Montana, said that after reflecting upon the results he had obtained in 36 cases, with 7 deaths, of bowel obstruction, he was prepared to go to less extreme measures to bring about relief than formerly. Most surgeons were inclined to look too much to the mechanical side of the problem and neglect the physiological. Even in strangulation by a hernia ring, the lumen of the bowel loop caught in the hernia did not suffer from complete closure, but rather was there a vascular obstruction. The bowel shut off was as complete when its coat died from a thrombotic process as when it was caught in a hernial ring. The real obstruction was one of function and not of pure mechanics. The danger to the patient arose from toxic absorption proximal to the infunctionate segment. With this in view, he had formulated for himself the cardinal principle of bowel drainage. The method of obtaining this might vary as the conditions vary, but it was the part of wisdom never to tax the patient's strength by long procedures except in the few instances, like a Meckel's diverticulum strangulation. If the condition was due to a band, invagination, herna, and the like, which admitted of easy remedying, the method should be applied, but if the case was one of uncertainty or necessitated an exhaustive and dangerous procedure, it was always better to let out the proximal bowel contents by an artificial opening until the general toxic state was much improved, when a more radical measure might be adopted to bring permanent relief. Inflammatory obstructions cleared up beautifully when the loop proximal to the involved segment was drained. Neoplastic or granulomatous processes might be readily handled after sufficient drainage was given the bowel above the lesion. The danger lay in attempting a complete procedure at the one time. Why should one attempt to resect the bowel in a very ill patient when a strangulated hernia existed? A simple local anesthetic opening would suffice to bring about relief from sufferings, physical and toxic. In a week the anastomosis became a matter of simple surgery. In one of his patients, a child of 12 years, obstruction became complete nearly three weeks after an operation for general peritonitis. He opened the abdomen only to find a conglomeration of bowel loops which to unravel would have probably caused death. He selected a portion of bowel, which because of its distention was recognized as proximal to the obstruction, and which, at the same time, seemed to be the most distal distended loop from the stomach. This was drained through a large rubber tube. In less than 2 weeks the fecal movements were passing again by the natural route and the artificial opening was allowed to close. Again, in the treatment for obstruction success lay in seeking to drain rather than to unravel the mechanical difficulty. When the latter could be done without adding a material chance to mortality, it was wise to adopt the measure, but when one added to the danger of the condition by so doing, he should simply drain artificially and at a later time a serious condition would have become simple.

PENETRATING WOUNDS OF THE ABDOMEN

Dr. Floyd W. McRae, of Atlanta, Georgia, said that of his 15 cases, 9 had the benefit of early operation with 7 recoveries. Seven of the 9 operations were for rifle or pistol-shot wounds, and all presented grave visceral injuries. One had an extensive laceration of the liver, with excessive

hemorrhage; the patient, exsanguinated, and pulseless at the wrist, recovered. One had three perforations in the stomach, with leakage; recovery. Three had multiple perforations in the small intestines, with leakage in all, 2 recoveries, 2 deaths. In one of the above the bladder was also injured, but recovery ensued. Two operations were done for stab wounds of the liver. Free hemorrhage in both case was controlled by suture of the liver wounds and gauze packing. Both recovered. He had treated four pistol-shot wounds of the abdomen expectantly, with three deaths and one recovery. One man with a stab wound, treated expectantly died. Of five cases, there were four deaths, one recovery. He had done two late operations for complications due to penetrating wounds, that might have been prevented by early operation; both died, a mortality of 100 per cent. The above statistics, his personal experience, observation and a careful review of the literature on penetrating wounds of the abdomen, led him to make the following conclusions as to civil practice:

1. In civil practice every suspected penetrating wound of the abdomen, under favorable conditions of practice, should have the benefit of wound tracing.

2. When the wound proved to be penetrating, an exploratory laparotomy should be done at once and visceral damage excluded or repaired as far as practicable.

3. There was far less danger from wound tracing than there was from probing or from masterly inactivity, while awaiting positive evidence of visceral damage requiring operative interference.

4. Local toilet with moist sponging for cleansing was better than free peritoneal irrigation.

5. When in doubt, it was safer to drain.

6. Operations done within two hours should not give a mortality over 25 to 30 per cent; within four hours, over 40 per cent; within 6 hours over 50 per cent; within 8 hours over 60 per cent; and within 12 hours, over 70 per cent.

7. After 12 hours expectant treatment was best unless there was some definite indication for operation.

The above deductions did not apply to military practice.

SOME RARE FORMS OF HEMATOMA

Dr. J. Garland Sherrill, of Louisville, Kentucky, reported three cases of hematoma presenting symptoms somewhat in common and extending beyond the usual time which these conditions lasted, one having existed for more than 10 years, and each of them continuing to increase in size from the beginning.

The following hypotheses were offered as possibilities in explanation of this condition:

1. The blood might flow through a sac returning into the vessel and remain fluid, at least in part, just as is the case in aneurism.

This proposition would seem to be fallacious because these hemorrhages were probably venous, and the tendency of a vein was to collapse immediately upon injury, and, moreover, no such patent vein had been noted in any of these cases.

2. The cellular tissues possessed the power of secreting a substance which tended to prevent coagulation.

This seemed clearly refuted because the infrequency of the occurrence of persistent hematoma would appear to prove the lack of such power of secretion.

3. That slight infection present in insufficient amount to produce suppuration resulted in such change that the blood could not be taken up by the absorbent vessels.

This theory seemed to the author to be irreconcilable to the facts in the case, for effused blood had but little power of resistance, and any culture of bacteria should find here an excellent pabulum, and suppuration would be inevitable.

4. That the tissues about a hematoma might be so dense or so compressed that the absorbent vessels would be occluded or obliterated, thus preventing the accomplishment of their normal functions.

This proposition seemed to the writer to have a more probable foundation in fact, although not accounting fully for the phenomena.

5. That coagulation took place, but when disintegration occurred the blood remained fluid, but was not absorbable.

This contention seemed also within the range of probability.

6. The constant escape of fresh blood occurred in a quantity sufficient to more than make up for the loss in volume from absorption.

In proof of this the author believed it could be demonstrated that the escape of fluid into hematoma did occur, as was shown in his cases, in which the tumor increased in size steadily. In one the bleeding occurred from a wounded vessel in the femur; in another, the source of the blood could not be discovered, but he thought it came from a small vein. There was also the possibility of blood manufactured inside the sac, as in the case of the development of the circulatory apparatus in the embryo, although to use it seemed highly improbable that this could occur in adult life. From the evidence at hand, the author concluded that the tissues about a hematoma from pressure

lost their power of absorption; that even though coagulation and disintegration occurred, resorption did not result, and that in some instances there was a continual addition to the amount of blood in the sac by an outflux from the damaged vessel.

OBSERVATIONS ON THE SURGICAL TREATMENT OF EXOPHTHALMIC GOITRE

DR. JOHN R. WATHEN, of Louisville, Kentucky, stated that preliminary ligation of the superior thyroid artery on one or both sides had not only better prepared the patient to withstand the more severe shock of thyroidectomy, but had also greatly reduced the size of the tumor in the otherwise hopeless cases, and he had had occasion to employ to great advantage this method in several of his worst cases. In the preparation of the patient for operation he had tried almost every remedy usually recommended to reduce the pulse and better the condition, but none had yielded such good results as absolute rest in bed and tincture of strophanthus. It was that class of cases where no preliminary treatment seemed to be able to make such temporary reduction which were especially dangerous. These usually had an irregular pulse, a degenerated heart muscle, low blood pressure in contradistinction to the majority, which had often a very much increased blood pressure, albumen in the urine, or enlargement and fatty degeneration of the liver. Aside from the proper selection and preparation of the case, the most important thing was a rapid and safe technic, suitable to the average surgeon and not a variety of complicated methods. The technic employed in his last 15 cases had been a slight departure from that usually recommended. With the head elevated in the reverse Trendelenburg position, and a large sand pillow under the shoulders and neck, the skin was grasped with two pairs of Jacobs' vossella forceps in the median line and traction made upwards. With the Mayo blunt pointed scissors, intsead of a knife, the skin and platysma muscle were incised, then with constant upward traction the incision was continued around the neck as far as was needed, using the scissors without in any way injuring the deeper structures. Next were ligated the anterior veins, and the ribbon muscles of the neck severed high up and retracted, then the capsule opened, and the tumor grasped with a stout pair of large vossella forceps, and traction made in an upward and opposite direction. This readily allowed the operator to wipe off the capsule of the gland with a piece of gauze, and placed the arteries and the veins to be ligated on the stretch. Forceps should always be used to clamp rapidly, and these could be placed close upon the tumor and ligated later with catgut after the complete enucleation. The isthmus was clamped with a large pair of forceps and cut V-shaped, parallel with the clamp, so that the raw edges could be turned inward by whipping over with catgut, instead of the usual method of carbolic acid cautery and alcohol, or Harrington's solution.

The wound should only be washed out with hot saline solution, and closed with a subcuticular catgut suture. Drainage through a lower stab wound with large open rubber tube, instead of gauze or a cigarette drain, should complete the operation.

CONSIDERATION OF THE MORTALITY IN ONE THOUSAND OPERATIONS FOR GOITRE

This paper will appear in the March number of SURGERY, GYNECOLOGY AND OBSTETRICS.

HYPOPLASIA IN ITS RELATION TO HEALTH AND DISEASE

DR. CHARLES P. NOBLE, of Philadelphia, said that man consisted of a body and intellect and a moral nature, and might degenerate in either one or all three of his natures, and this degeneracy might be inherited or acquired. If the potential of life received by the ovum was imperfect there resulted an imperfect body. The effects might be most marked in the physical body, in the intellect, or in the moral nature. When the potential of life was deficient, there resulted imperfect evolution and an imperfect adult, that is, the adult was imperfectly developed in all his parts — bones, muscles, circulatory apparatus, nervous system, ligaments, fasciae — in other words, man was suffering from hypoplasia or imperfect development. The same conditions in kind, if not in degree, might be brought about by environment, malnutrition, insanitary conditions of living, traumatisms, or intercurrent disease which acted by arresting development, that is, by causing hypoplasia. If the potential of life received in the ovum was very defective, there resulted embryonal or fetal death and abortion. In other cases there resulted monsters or instances of imperfect development, such as spina bifida, cleft palate, etc. There resulted idiocy, imbecility, and insanity of hereditary type, or the lesser degrees of what had heretofore been called functional nervous diseases or the symptoms complex, such as epilepsy, catalepsy, hysteria, nervous instability, and a tendency to the development of nervous prostration. In infancy and childhood there resulted a tendency to nutritional diseases which, acting as environment, tended to arrest normal evolution or development. In certain cases chloro-

sis followed, due to hypoplasia of the circulatory apparatus and the blood-making organs. Puberty was delayed, and in a woman menstruation was abnormal and painful. The young adult and the adult through imperfect development might retain the body form of the child, that is, neuter. This was the body form of the consumptive. The vertebral column did not retain its normal curves; the chest was flattened, and the abdomen protuberant, and, owing to the imperfect development, the hypoplasia of the ligaments and the muscles, the attitude of the man, was such that, as it is said, he looked as though he was tied together with yarn string. There resulted a loss of relative immunity, and so when we contrasted the diseases of civilized man with those of the savage, we found there was a tendency to the so-called surgical infections, including puerperal sepsis, appendicitis, tuberculosis, etc. There resulted a tendency to visceral ptoses due to the imperfect development of the ligaments of these organs and to the insufficient support of the abdominal mucsles. This explained the failure to relieve the symptoms when such cases were operated on; whereas, when the cases of acquired ptoses in normal individuals were operated upon, the local diseases were cured and the patients got well. There resulted imperfect function of the glandular cells of the body, with consequent imperfect digestion, so-called nervous dyspepsia, when this was not acquired from environment. There resulted nervous instability, hysteria, catalepsy, epilepsy, insanity, idiocy, etc., which were but the manifestations of the various degrees of imperfection in the development of the nervous system, and these symptoms complex bore the same relations to hypoplasia of the central nervous system as a cough did to a bronchitis.

Degenerates or defectives were the weaklings, the unfit, and the process whereby nature got rid of them was through progressive degeneracy until they lost the power of generation or deliberately refused to exercise it.

In medicine this biological principle and the recognition of its results upon the body in the arrest of the development would make simple many things heretofore obscure, and would make prognosis and treatment rational instead of guesswork, as they had been. These patients, when afflicted with diseases, were different from normal individuals. When the local condition was cured in a normal individual, the patient was well; whereas in the defective, when the local trouble was cured, he still had hypoplasia, and so might retain the most of his symptoms.

The greatest hope in the future lay in prevention. Through state medicine and through individual prophylaxis, the children of defectives and those who acquired hypoplasia must not be brought up under the usual environment. They must not be sent to school in the usual way, but must be sent to the country and live according to the laws of nature, whereby their development may become as perfect as is possible under the conditions. These people were the weaklings and could not stand the strains and stresses of life, and when subjected to them they always gave out and got nervous prostration. Therefore, the physician in dealing with these people, should first treat them along lines of rest and improve their nutrition, and then must show that they could not perform the usual labor of other people, but must accept this as a fact and limit the expenditure of their energy to that which they manufactured. They could never do the full work of a normal man or woman.

SURGERY OF THE PLEURA

Dr. John B. Murphy, of Chicago, said that pneumothorax was not as dangerous a condition as was formerly believed. In discussing lesions of the pleura, one should first consider the primary infective, perforative lesions, which demanded prompt and immediate action; second, chronic indurated lesions, which called for masterly inactivity, so far as operations were concerned. In the first class of cases the use of the exploring needle between the ribs will usually afford relief; but incision would give these patients immediate relief. Aspiration did not cure chronic conditions of the pleura. According to statistics of one thousand cases treated by simple aspiration, there were only two cures reported.

In the suppurative types of infection of the pleura, absorption of the toxic products could be stopped, sterilization of the fluid effected, and the necessity for opening the chest avoided. A number of agents had been used for this purpose. Perchloride of mercury had been used with success. Formalin, which has little or no toxic effect, had great sterilizing power The author had used it in cases of excessive hydrops, where a lung was compressed, and with almost one injection the secretion was stopped. Pus cases were not cured with one injection, except in those of children. Take a case of pneumococcus infection in a child, in whom formerly the ribs were resected, if one aspirated and injected two or three ounces of a two per cent solution of formalin and vaseline, prepared twenty-four hours before, repeating the injections from time to time, as a rule, a cure

would be effected. One injection might bring about a cure in some instances.

In the other variety of cases, in which there was a dense, firm mass of cicatricial tissue, which would not contract, we had a different condition. This tissue would remain for years without absorption because many times it had large deposits of calcium salt in it and could not collapse. In these cases one could make use of the same injections, but they must be given more slowly. The injection of formalin and vaseline sterilized the fluid contents and prepared it for absorption, and finally in six months thereafter we would have a sanguinolent fluid, and in twelve months the patient was practically well without having any tube in his side.

SPLENECTOMY FOR SPLENOMEGALY OF DOUBTFUL CLASSIFICATION

Dr. M. C. McGannon, of Nashville, Tenn., read a paper with this title, and reported a case of splenectomy. The case presented some unusual features not heretofore recorded in connection with primary splenomegaly. The patient was a white woman aged 43. Chronicity was doubtful, since the patient first noticed the enlargement of the spleen only a few months before she came under the author's observation. Her physical condition had been below par for a year or two; but preceding an attack of pneumonia, which was four months before she discovered the splenic enlargement, she had not considered herself in any sense a sick woman. Anamia, hematemesis, jaundice, liver enlargement, all terminal symptoms, might have arisen later had the disease been permitted to continue. The most marked and unusual features of the case were the general enlargement of the superficial lymph nodes and the myxedematous symptoms; thickened, puffy skin, and mental hebetude, with complete disappearance of all symptoms and pathological conditions in other tissues after the removal ot the spleen.

RELATION OF SURGERY TO THE NEUROSES, WITH SPECIAL REFERENCE TO NEURASTHENIA

Dr. Charles M. Rosser, of Dallas, Texas, said that surgery was the most definite art with which medicine was concerned, and neurasthenia the most vague of diseases. Writers mentioned heredity and exercise, but ignored intercurrent causes independent of which, in many cases, physiology would not be disturbed, on account of predisposition and excitation. Nuerasthenia was both a psychosis and a physical condition, and might be induced by surgical conditions which disfigured, disabled, or caused distress. As physical causes, deformities which might not affect vital functions, but which embarrassed sensitive temperaments, were factors. Extensive scarring from burns upon exposed surfaces was prevented by surgical skin grafting. Goitre by sight and secretory disturbances might cause stomach conditions that were amenable to surgery by digestive deviations and those disorders of the bile passages, as was true of chronic appendiceal involvement, which tended toward autointoxication, and insomnia was the most frequent forerunner of mental depression. The clinical examination should be as careful as though the symptoms were not exaggerated. The prognosis should be more guarded, but the patient should not be denied opportunity of physical relief on account of nervous and mental conditions, and should be subjected to no procedure that was not justified by clinical findings. The patients should always have the benefit of all doubts that were reasonable.

FIBROID TUMORS AND PREGNANCY

Dr. Charles L. Bonifield, of Cincinnati, pointed out that fibroid tumors of the uterus were said to be the penalty a woman paid for celibacy. All observers agreed that they were much oftener seen in women who had not borne children than in those who had, and one could safely say that sterility predisposed to fibroids, and that fibroids predisposed to sterility. Fibroid tumors had a tendency to render women sterile in three ways: First, the hypertrophic endometritis they produced rendered the endometrium unfit to receive and nourish the ovum. The nearer the fibroid was to the endometrium, the more marked its effect on this membrane. Second, they were frequently complicated by, and apparently caused disease of the appendages, which prevented conception. Third, they might so displace the cervix that it was not bathed in seminal fluid during the sexual act. But as a fibroid might exist without producing any of these conditions, and as pregnancy might occur in spite of the presence of one or more of them, the coexistence of fibroid tumors and pregnancy was by no means extremely rare. It was probably more frequent now than formerly, for the reason that women were marrying later in life, and thus putting off their child-bearing until they had reached the age when fibroids were prone to develop. Pregnancy by the physiological hyperemia of the uterus to which it gave rise usually caused fibroids to grow rapidly. During the process of involution, following the normal termination of pregnancy, fibroids might decrease in size very perceptibly. Cases had been reported where they had disappeared

entirely. Fibroid tumors might have little or no effect on pregnancy, or might give rise to the most serious complications. Submucous fibroids might cause the premature expulsion of the ovum. Pregnancy might go to term and labor might be normal but followed by severe hemorrhages, the fibroid acting as a foreign body in the uterus and preventing normal contraction and retraction of the muscular fibers. The efforts of the uterus to expel the fibroids might be successful. There was danger in such a case if the fibroid be attached near the fundus, that inversion might follow the expulsion, for if a fibroid had developed between the folds of the broad ligament, it might prevent the uterus from rising into the abdomen as pregnancy advanced, and give rise to symptoms so severe as to demand immediate surgical relief. A fibroid tumor springing from the lower part of the uterus might so fill the pelvis as to prevent the passage of the child, either prematurely or at term. Subperitoneal or interstitial fibroids that were interfering with pregnancy or promised to interfere seriously with delivery, might be removed by myomectomy. Numerous cases had been reported where this operation had been successfully done without interrupting pregnancy. Only one such case, however, had come under the author's observation. Myomectomy should usually be limited to those cases in which the tumors were not numerous and were easily accessible. In spite of the reported cases of myomectomy, one could not expect the uterus to withstand too much traumatism without rebelling. The part of the uterus from which the tumor sprang was important. Fibroid tumors might be the cause of extrauterine pregnancy.

Noble had reported six cases of ectopic pregnancy complicating fibroids. Eight cases were reported by the author to illustrate the various phases of surgical interference during pregnancy.

VAGINAL HYSTERECTOMY FOR CARCINOMA OF THE CERVIX

Dr. Henry T. Byford, of Chicago, said the relative value of the vaginal and abdominal routes was still under discussion. The advocates of the abdominal route were inclined to be less radical than its propounder, Emil Ries — in order to diminish its excessive mortality, while some of the German operators in their attempts to be more radical were increasing the dangers of the vaginal method by splitting the vagina and opening freely into the pelvic connective tissue. He was satisfied that the permanent results might be improved sufficiently to give it an important place in the future, and proposed a method of causing sloughing of the broad ligaments by the combined use of silk ligatures and strong forceps.

In this way much more of the connective tissue in the broad ligament and about the cervix could be removed than by either ligatures or forceps, as ordinarily employed.

The essential part of the method consisted in ligating the broad and sacro-uterine ligaments as far from the cervix as possible after having pushed the ureters out of the way. After the uterus had been removed, the broad ligaments were pulled still farther down and strong forceps applied still farther away, which were clamped so as to cause sloughing of all tissues within their grasp.

Dr. Byford exhibited a pair of forceps which he had devised and which, he thought, obviated some of the objections that were found to the ordinary broad ligament forceps. Most forceps projected too far into the peritoneal cavity, and caused pain; they sometimes failed to grasp the tissues firmly at all points, and thus might not cause prompt and complete sloughing; and they projected too far out of the vulva and were in the way externally. The forceps shown were short, and would not only hold the stump down near or at the vaginal edges, but they did not form a large mass of metal projecting between the thighs. They were blunt and slightly hooked at the end of the blades, and thus not only did not scratch the intestine, but did not allow the pressure to force the edge of the flattened stump beyond their grasp. They were strong enough to exert a uniform pressure that caused shoughing even when left on but a few hours. He usually left them on for twenty-four hours, although ten or twelve would probably be long enough.

TEMPORARY VENTRO-SUSPENSION OF THE UTERUS; ITS TECHNIC, INDICATIONS AND END RESULTS

Dr. Edward H. Ochsner, of Chicago. This article appeared in the January number of Surgery, Gynecology and Obstetrics.

ABDOMINAL ANEURYSM

Dr. Murat Willis, of Richmond, Virginia, reported a case of abdominal aneurysm treated by wiring, although the result was unsuccessful. A critical study of 21 cases thus far reported led to the conclusion that surgery so far offered no certain relief for this malady. Of these 21 cases, the subsequent history of 3 was not recorded; in the remaining 18 death ensued in every case. The duration of life after operation in this series varied from one hour to nine months, with an average duration of less than 50 days. The operative technic, as developed for this condition, would

seem to be absolutely perfect, and based upon sound surgical principles, but the fact remained that this method of treatment was disappointing, and the last word had not yet been said concerning the surgical treatment of abdominal aneurysm.

Dr. R. S. Cathcart, of Charleston, S. C., reported a case of false aneurysm of the femoral artery following typhoid fever.

ELEPHANTIASIS OF THE MALE GENITALIA

Dr. J. Norment Baker, of Montgomery, Alabama, discussed this subject, and said the comparative rarity of the affection in America furnished the stimulus for preparing a paper on this subject. He reviewed the literature, and reported a very interesting case of elephantiasis in a colored man, aged 52, upon whom he had operated successfully for its removal.

ANATOMICAL AND PHYSIOLOGICAL RESTORATION VERSUS REMOVAL OF THE INTERNAL GENERATIVE ORGANS OF WOMEN

Dr. John E. Cannaday, of Charleston, W. Va., said the advantages of waiting and of giving nature a full opportunity in cases of infected Fallopian tubes were great. The damage done by inflammation in many cases was small. He spoke of the bearing of the woman's social condition on the case, and pointed out the necessity for the wage earner of small means to get well quickly. He discussed the desirability of letting his patient decide what was best to be done in many cases. The non-operative treatment of tubal inflammation was really cautious neglect. The measures taken were to divert the attention of the patient. Pelvic massage was of benefit in removing the results of inflammatory attacks. There were numerous valuable methods of treating uterine pathology without the removal of both uterus and disease. It was seldom necessary or advisable to remove the ovaries.

CANCER OF THE PAROTID GLAND

Dr. George A. Hendon, of Louisville, Ky., read a paper in which he reported five cases and of having performed an operation successfully in each case.

EXTENSIVE INJURY TO THE ABDOMINAL WALL; OPERATION; RECOVERY

Dr. Rufus B. Hall, of Cincinnati, reported a case of an accident to an infant, seventeen months old, with extensive injury to the abdominal wall, and evisceration of all the small intestines, with recovery of the patient. The child's mother was giving him a bath by holding him on her lap in the kitchen where she had been canning fruit. To facilitate rinsing off the soap, she stood the child on the drain board of the sink, which was two and a half feet high. The mother left the child standing, and went across the room for a towel. The child fell, striking the right side of the abdomen on the top of an empty half gallon glass Mason fruit jar. The impact broke the jar, telescoping it, leaving four sharp points remaining on the bottom of the can. One of these made a large wound in the side of the abdomen and the intestines at once protruded on to the dirty kitchen floor, picking up several fragments of peelings of tomatoes and pears. The child had lost a great quantity of blood due to the injury of the deep epigastric artery. One prong of the glass cut through the tenth rib, dividing the intercostal artery. Another one made an opening into the abdomen three inches above the large opening. All of the small intestines, the pyloric end of the stomach, and four inches of the ascending colon were outside of the abdomen. There were sticking to the coils of bowel and omentum several pieces of the peelings of pears and tomatoes. When Dr. Hall arrived the child was semi-conscious, pulseless, cold extremities, and rapid, superficial breathing. In addition to the division of the deep epigastric artery, and the intercostal artery, there was a ragged-shaped wound in the omentum and one in the mesentery. The intestines were largely distended with undigested pears. The temperature twelve hours after the accident was 106.5, and remained high for twelve hours longer, at which time he succeeded in getting the intestinal tract emptied. Before the bowels were emptied, the child was delirious, with general twitching of the muscles throughout the body. Within two hours after the bowels were emptied, the temperature declined to 100, and convalescence was established. The child made a nice recovery.

SURGICAL TREATMENT OF EPILEPSY

Dr. W. P. Carr, of Washington, D. C., reported twenty operations for epilepsy, and said that eight of these cases had been cured to date, or were well when last heard from; one after nine years, one eight and a half years, one seven and a half years, one four years, one three and a half years, one after one year, and two after three months. Five of these cases, probably not traumatic, in which the habit was well established, had been cured for over three years; three of them for seven, eight and nine years, respectively. Nearly all of the cases were benefited temporarily, most of them being so much improved as to make the operation justifiable. One was confined in

Government Hospital for the Insane, and another, a complete imbecile. Both regained the normal mental condition, and have remained mentally sound to date. Only one patient was not benefited. The best results were in cases apparently most unfavorable. He believed that operation for cases of long standing traumatic epilepsy, and idiopathic or hereditary epilepsy, had been abandoned upon theoretical grounds, without a fair trial of modern surgical methods, and that such cases should be operated upon for the following reasons: 1. There was very strong evidence to show that a considerable proportion of even the most unpromising cases could be cured. 2. In view of the hopeless and progressive nature of the malady, the operation would be justifiable if even a very small percentage could be cured, or even greatly benefited. 3. No systematic attempt has been made to find what percentage of cures might be obtained, since modern methods had made the operation easy and safe, and that such attempts should be made. 4. There was so little danger in the operation of either death or unpleasant sequelae. 5. Because of the freedom from pain or discomfort of any kind following the operation which was in marked contrast to the discomfort following most other operations of equal severity.

He recommended opening the skull by making a large osteoplastic flap over the region indicated by focal symptoms, when they were present, or over the Rolandic area on either side when there were no focal symptoms. A careful examination should then be made by opening the dura widely, inspecting and palpating the brain and meninges, and by careful exploration with a grooved director, and any offending body, such as depressed bone thickened dura, abscess, cyst, tumor, inflammatory exudate, or edema, should be removed as far as possible. Most epileptic brains were edematous and the serum might be rapidly drained away by opening the dura and by inserting several grooved directors into the brain substance. Good results had followed more often where a large flap was made, and a large surface of the brain exposed. The flow of serum might continue for several days when a soft rubber drain was used.

SUCCESSFUL OPERATION FOR VESICO-UTERINE FISTULA, WITH LOSS OF FUNCTION OF THE VESICAL AND URETHRAL SPHINCTERS

Dr. R. S. Hill, of Montgomery, Ala., reported the following case: Patient, 32 years of age, weight, 155 pounds, was delivered of her second child in February, 1908, after being in labor eighteen hours, which was more severe and lasted longer than her first confinement, eight years ago. The child was born dead, though fully developed, and presentation was normal. Within one hour after the completion of labor, she felt an intense desire to urinate, which was followed by a tremendous gush of water from the vagina. From this time on the urine passed continually and entirely through the cervix uteri. Vesico-uterine fistula was diagnosed. She was brought to the essayist six weeks later, and through a T-shaped incision in front of the cervix uteri the openings into the bladder and uterus, which were about the size of the end of the index finger, were closed with catgut sutures. Union was perfect, but when the patient left the bed it became evident, from the continuation of the urinary incontinence, that the vesical and urethral sphincters had lost their function. She returned home and remained until October 15, when she came back in the same condition, except a three months' pregnancy to complicate matters. The following technic, which as far as the author knew was original, was used: With a metal sound in the urethra as a guide, a median incision was made through the vaginal mucosa from a point one inch on the bladder wall to the meatus urinarius, and then around this orifice. The mucosa was dissected from the underlying structures to the extent of one inch or more transverse measurement. The sound in the urethra was now changed for one of smaller size. Commencing at the bladder end of the denudation, the muscular structures were folded in or brought together with a continous catgut suture passed transversely, but never deep enough to include the vesical or urethral mucosa. As the gut was made taut after each passage of the needle, the sound was drawn from its grasp. The vaginal mucosa was now trimmed and made to fit snugly over the underlying tissue and held in position with silkworm gut sutures, some of which were carried through the muscular tissues, re-enforcing the catgut sutures. Patient was catheterized with a small soft rubber catheter every four to six hours. The author was opposed to leaving an instrument in the urethra after this operation, and suggested the advisability of establishing vesico-vaginal or even suprapubic drainage after the operation, in order not to disturb the parts until firm union was established. The extent of the dissection was to be regulated by the condition found in the individual case. Furthermore, if any one part of the muscular wall, as, for instance, either of the sphincter muscles, appeared more injured than the rest, then a special suture of catgut should be used to repair it.

The following papers were likewise read: "Report of a Case of Urethral Transplantation," by Dr. John D. S. Davis, of Birmingham, Alabama; "Operative Treatment of Tuberculous Joints," by Dr. Horace J. Whitacre, of Cincinnati, Ohio; "The Transverse Abdominal Incision," by Dr. S. M. D. Clark, of New Orleans, La.; "Further Observations on Transfusion, with a Note on Hemolysis," by Dr. Geo. W. Crile, of Cleveland, Ohio.

OFFICERS

President, Dr. Stuart McGuire, Richmond, Virginia; first vice-president, Dr. John Young Brown, St. Louis, Mo.; second vice-president, Dr. R. S. Cathcart, Charleston, S. C.; treasurer, Dr. Wm. S. Goldsmith, Atlanta, Ga.; secretary, Dr. William D. Haggard, Nashville, Tenn.

Hot Springs, Va., was selected as the place for holding the next annual meeting; time, third Tuesday in December, 1909.

CORRESPONDENCE

PRIORITY OF THE TRANSVERSE ABDOMINAL INCISION. THE PFANNENSTIEL INCISION

DR. FRANKLIN MARTIN, EDITOR OF SURGERY, GYNECOLOGY AND OBSTETRICS.

I have lately made a research on "Transverse Abdominal Incision." I found since Kustner and Pfannenstiel brought out their operation, the priority is claimed by several surgeons.

In a monograph by John Hull, M. D., entitled "A Defense of the Cæsarean Operation, with Observations on Embryulcia, and the Section of the Symphysis Pubis," addressed to Mr. W. Simmons of Manchester, published at Manchester, England, printed at 9 Spring Gardens by R. and W. Dean, 1798, I find the following.

I briefly quote from pages 106, 107, and 108, that it may reach the claimants of the priority.

"You proceed to say: 'The most serious objection (to the transverse incision), however, will be the utter impossibility of any extravasation that shall take place during or after the operation, being afterwards discharged. . . . . The wound is actually situated in the most depending part of the cavity of the abdomen, even if we consider this as extending to the bottom of the pelvis; consequently it is in the situation most favorable to the discharge of extravasated fluid. . . . . And do you not perceive, that many advantages are derivable from making the incision in this direction, and situation? Do you not see, for example, an advantage, from having the external incision in that direction of the fibres of the M. Transverse Abdominis? Do you not perceive, that the Lochia will be much less likely to be effused into the cavity of the abdomen, when there is no wound in the inferior part of the uterus?'"

The Pfannenstiel oblique incision is much older. In the Journal de Medicine for 1770 (Heath's translation, vol. iii, p. 361) the external abdominal incisions made by surgeons are described. It describes an incision made too high; then another made obliquely under it, and three stitches put in the uterus, and the operation had all possible success.

Trusting that you will find the above available for publication, and that it may reach the attention of the claimants as well as the profession in general, I am your most obedient in fraternity,

CARL H. VON KLEIN, M. D.

CHICAGO, Jan. 21, 1909.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

JOHN B. MURPHY, M. D.
FREDERIC A. BESLEY, M. D.
WM. C. DANFORTH, M. D.
AIMÉ PAUL HEINECK, M. D.
E. WYLLYS ANDREWS, M. D.
WM. R. CUBBINS, M. D.
M. G. SEELIG, M. D.
GEO. E. BEILBY, M. D.

Fixation of a Displaced Kidney and Liver by Magnesium Plates. DR. JOSEF GOBIET. *Zentralblatt fur Chirurgie*, No. 407, October, 1908.

The continually proposed new methods for the fixation of the displaced kidney are a proof that, up to the present, no completely satisfactory method has been devised.

The secure fixation of the kidney to its normal position depends upon the security of the suture. If one places the suture through the kidney parenchyma, the slightest pull carries it out. If one places the suture, as is generally done, through the loosened capsule and pulls the kidney half way to its normal position, a small bridge of tissue, only, remains, and one finishes the operation with a feeling of insecurity. This uncertainty of the suture led some to tamponade (Riedel), and others to depend upon the tamponade alone. This procedure requires too long a rest in bed. Similar difficulties are encountered in the fixation of the displaced liver.

Payr proposed the use of resorbable magnesium plates for the suture of parenchymatous organs. I have used them in two cases of displaced kidney, and in one case of total displacement of the liver, in the same way, and fixed the organ between magnesium plates and the rib by means of a silver suture. The method is usually quickly performed.

With the fixation of the kidney I proceed in the following manner: Skin incision along the under border of the twelfth rib, obliquely to the crest of the ileum. Isolation of the twelfth rib from the muscles and pleura, in the middle of the rib in a position about three cm. broad, are bored two holes; the kidney is next laid free by partial resection of the fatty capsule, the loosening of the capsula propria is unnecessary. Along the anterior surface of the kidney, between its middle and lower third, a magnesium plate four cm. long, one cm. broad, and one mm. thick, is laid, corresponding to the long axis of the kidney. Then with a moderately strong silver suture, doubly armed with blunt needles, the entire thickness of the kidney, and the corresponding bored holes of the ribs, are pierced and tied above the ribs. One must be careful that the kidney is not too strongly compressed between the ribs and the magnesium plate. Suture of the muscles and fasciæ with catgut makes it complete without drainage. Healing occurs by primary intention. The patient is confined to the bed between eight and ten days.

In one case of complete displacement of the liver, I proceeded in the following manner: Incision along the right border of the rectus muscle, beginning at the level of the navel, and extending downward several centimeters beneath the rib border; loosening of the soft tissues along both sides of the rib border; two to three centimeters from the free border of the ribs, two holes are bored in the ribs, the distance between each two holes is about four centimeters; now are two magnesium plates, with perforations, laid along the under surface of the liver, one centimeter away from the free border of the liver. Then a stronger blunt needle, doubly armed with silver thread, is introduced through the magnesium plates, the entire thickness of the liver, and the corresponding perforations of the ribs; healing by primary intention.

The principal points of my method are the following: The suture must be introduced through the entire thickness of the organ. The position which I acquire is ideal, and a good, lasting result may be expected.

FREDERICK G. DYAS.

Experimental Investigation of the Reaction to Bacterial Infection of Animals Exposed to the X-Ray. *Mitt. aus. d. Grenz. d. Chir. u. Med. B. 19 H. 1.*

Laewan undertook this work in order to confirm the opinion that animals exposed to the X-ray have their resistance increased, owing to the solution of leukocytes and the consequence setting free in the blood plasma of bactericidal substances. Numerous experiments on rabbits, guinea pigs, and rats, furnished data pointing to a conclusion directly opposed to the above assumption. Even after long periods of exposure to the X-ray and the destruction of a large number of leukocytes, the bactericidal strength of the blood serum of the various animals was not changed. Moreover the solution of the leukocytes occurring either in the blood of animals or induced artificially did not result in the production of any bactericidal endoenzymes. As a matter of fact, the resistance of the animal experimented upon was always lessened. If the exposure to the ray was not too prolonged, infection was always accompanied by a polymorphonuclear leukocyerosis, but if the ex-

posure was a long enough one, it was impossible to demonstrate leukocytosis. Furthermore the exposure to the ray seemed to inhibit the formation of agglutinins and bacteriolysins, phenomena which almost invariably accompany bacterial infection. M. G. SEELIG.

Transplantation of Thyroid Gland. PROF. THEODOR KOCHER. *Archiv. für Klinische Chirurgie*, 1908, Band 87, Heft. I, p. 1.

In this article, Kocher discusses first the various methods of thyroid transplantation which have been attempted in the past — all with little or no functional result — and then describes at length a new method which he has devised which apparently offers more hope of success. Thyroid transplantation is used in cases of "cachexia strumipriva" and cretinism. The transplantations are made into the bone marrow of the tibia, this bone lending itself best to such an operation. The process is carried out in two stages. In the first stage the marrow cavity is opened, a small pocket formed, and a silver ball about 1 x 1.5 cm. introduced. The wound is then closed. After two or three days it is reopened, the ball removed and the fresh gland tissue implanted into the cavity thus formed. In this way he avoids extensive hæmorrhage about the implanted tissue, a layer of granulations having formed about the ball. Obviously the difficulty is in obtaining normal thyroid tissue. Kocher plans the second stage of this transplantation so that it is carried out at the same time that a patient is operated upon for some thyroid lesion, from whom may be obtained, if possible, normal thyroid tissue. We know that very often tumors or cysts require removal where the remaining gland is normal. It is from this type of case that Kocher obtains his tissue for transplantation, and *not* from the hypertrophied glands.

Experimentally, thyroid tissue thus transplanted in dogs has been proven efficient for the maintenance of life. If the bone containing the transplanted tissue was resected, the animal quickly died.

I recently had the opportunity to observe personally this work in Professor Kocher's clinic. In one case in which the transplantation had been done some months previous, Professor Kocher was positive that benefit had resulted. Most of his cases were of too recent date to allow him to form any conclusions as to its value. He expressed himself, however, as very hopeful of its possibilities. GEORGE E. BEILBY.

Cause of Atrophy in Joint Diseases. ARTHUR T. LEGG, Boston, Mass. *American Journal of Orthopedic Surgery*, August, 1908.

Dr. Legg concludes after a series of experiments upon rabbits in which he used the following plan:

1. Infection of a joint with tubercle bacilli, no immobilization.

2. Infection of a joint with tubercle bacilli with immobilization.

3. Immobilization without infection. That the atrophy is due to disuse because the latter two classes were similar and with more atrophy than in the first class. In determining this he measured the diameters of the muscle cells, the arteries and bone, also the bone cortex.

He also observed a large number of ambulatory patients with tuberculosis of the joints, and compared these with ambulatory cases with functional diseases and contusions with a limp, and found that where the time elapsed and the limp were the same, that the amount of atrophy present was the same. This he believes to be due to a vaso constriction which takes place as soon as a limb is placed in absolute rest. This he claims will cause an appreciable diminution in size in forty-eight hours. WM. R. CUBBINS.

Blastomycosis; A Report of Two Cases Resembling Bone Tuberculosis. EDWIN W. RYERSON, M. D., Chicago. *American Journal of Orthopedic Surgery*, August, 1908.

Dr. Ryerson reports two cases that are indeed very similar to bone tuberculosis — with involvement of the lungs and skin. The diagnosis was made by the sputum and the skin lesions. The treatment had no effect. WM. R. CUBBINS.

The Treatment of Fracture. H. TYRRELL GRAY, M. A., M. C. Cantab. *The British Medical Journal*, June 13, 1908.

Mr. Gray discusses the varieties of fractures and points out the value of operative measures. His experience has led him to the conclusion that never by other than operative measures, can the fragments of a spiral fracture be placed or maintained in even approximately good position. Conservative methods have usually led to shortening of about one inch or more in the long bones, eversion, deformity, and pain in varying degrees for as long as several months or more, making it necessary many times for the poor to seek a less active occupation. In contrast, the operative measures show a perfect restoration of function, no shortening at all, in ten weeks at the outside.

The deplorable stiffness, deformity, and inability to resume active life in the conservative treatment of Potts' fracture has led most surgeons to consider operation the method of choice.

Convalescence in cases operated on has taken about half the time in fractures of the femur, and in fractures of the tibia and fibula about two-thirds the time, necessary for an inferior functional result in those treated conservatively, while aching, pain, and stiffness are absent altogether.

Paralysis in fractures of the humerus, due to interference with functions of brachial plexus and musculospiral nerve, which sometimes have resulted from conservative treatment, is never present. You are morally certain of complete functional recovery in six to eight weeks, when operated on at once. The risks of operation are summed up in sepsis only, and as to suppuration, the author has never seen it result from operative interference.

As to the disadvantage of leaving plates, screws, wires, etc., in the bone, no single instance has been presented for reoperation, and such a reoperation if necessary would be the simplest procedure.

CHARLES R. ROTH.

Tuberculin in Orthopedic Surgery. Clinical and Laboratory Reports. JOHN JOSEPH NUTT, M.D., and T. W. HASTINGS, M. D., New York. *American Journal of Orthopedic Surgery*, August, 1908.

Drs. Nutt and Hastings report a large number of cases and from their experience draw the following conclusions as to the use of tuberculin in the treatment of tubercular arthritis.

Tuberculin is of decided value in the treatment of tubercular joints. It may be administered during any stage of the disease.

The initial dose should be from .0001 to .0002 mg. or m. 3 of a solution, 1 c. c. of which equals .000001 gm. The next dose may be m 5, and so on up until .001 mg. or m. 1½ of a solution, 1 c.c. of which equals .00001 gm., is reached.

Until the dose of .001 mg. is given, the inoculations should be given every three or four days, twice a week. After that every five days, or once a week. When the dose has reached .01 mg. or m. 2 of a solution, 1 c.c. of which equals .0001 gm., the vaccinations should be made once in ten days and the greatest of care should be taken to guard against reactions. Larger doses are not advisable. The treatment should be interrupted for a month or two, and the second series of inoculations should be begun with from .0001 to .0002 mg.

A slight local reaction, whether simply an erythematous condition of the skin or an indurated mass at the site of injections, is of no consequence, but injection should be made elsewhere until the part is again normal.

The temperature should be taken every four hours, for forty-eight hours, before and after each inoculation. A sudden or unusual rise in temperature had better be followed by a much reduced dosage or an omitted dosage.

Constitutional symptoms, such as nausea, chilly sensations, and headache, occurring within forty-eight hours of a vaccination, demand a cutting of the dosage by one-half, and a slower rate of progression.

The opsonic index is not to be used as a guide to the removal of mechanical apparatus.

Tuberculous individuals show variations in the indices, which are more marked than in the normal individual. Inoculations are to be continued regardless of the indices, the clinical symptoms alone to be the guide. Tuberculin can be safely given without ascertaining a single opsonic index.

Tuberculin in these cases does not of itself act as a cure to be relied on solely. It is only to be classed as of assistance to both the local and general constitutional treatment. While it seems to be the best tonic we have for these patients, all of them gaining in weight, in their blood constituents, and general well being, it also has an effect on the local infection, which cannot, we believe, be wholly accounted for by the improvement in the general health.

The encouraging interest in prosecuting this work continuously shown by Dr. Shaffer was of great assistance and fully appreciated.

We would like to state here, also, that our thanks and those of any one who may find this paper of value, are due to the resident surgeon of the hospital, Dr. Howard D. Urquhart, for his willingness in helping with the undertaking. WM. R. CUBBINS.

The Artificial Bloodless Field in the Lower Half of the Body. DR. MOMBURG. *Die künstliche Blutleere der unteren Korperhälfte. Zentralblatt für Chirurgie*, 1908, No. 23.

In a preliminary communication the author describes a new method of hæmostasis for the entire lower half of the body. It is intended for use in the major operations of the pelvis and upper part of the thigh.

The method consists of the application of a constrictor, a rubber drainage tube, around the waist of the patient, in the region between the last rib and the crest of the ilium. The patient in the recumbent position, a rubber drainage tube, in size slightly thicker than a finger, is passed slowly several times around the body of the patient — two to four times is sufficient, until the pulsations of the femoral artery can no longer be felt.

At the time of loosening the constrictor, which is done with the legs in an elevated position, an alteration of the heart's action of short duration occurs, as a result of the sudden readmission of the circulation to the entire lower half of the body.

The danger threatening from this direction can be easily avoided by applying an occlusive rubber bandage to both legs and thighs while the constrictor around the waist is still in situ. By successively loosening the turns of the bandage, after removal of the constrictor, the circulation is re-established more gradually. This method is simple and effective, and though apparently heroic, is claimed to be devoid of danger when proper precautions are observed.

Injuries to the ureters and intestines, which might first of all be thought of, have not been encountered. The thickness of the abdominal wall mitigates and distributes the direct pressure of the constrictor. Disturbances of the heart's action at the moment of application of the constrictor are unimportant in character.

Anæmia of the spinal cord; a source of danger in the experiments on dogs, is excluded in human beings, because the human cord, unlike that of the dog, ends above the point of constriction. A number of other objections which might be brought forward against the method have not asserted themselves in practice.

In dogs, by modifying the technique, rubber bandage instead of rubber drainage tube, the constrictor has been left in position for 1½ hours without harm. In healthy human beings — 2 cases, the constrictor has been applied, without anæsthesia, for a period of 5 minutes without any resulting injury.

To the present time the method has been put to practical use in two cases of larger operations. The use of the method was successful and was not attended by any injury to the patients. In the one case the constrictor was in position for 43 minutes, in the other, for 18 minutes. In the latter, a case of sarcoma of the acetabulum, operated by Prof. Bier under spinal anæsthesia, in which the entire leg with nearly the entire same side of the pelvis were removed, the method was fully successful. JOSEPH L. ABT.

Subtemporal Decompression in a Case of Chronic Nephritis with Uremia; with Especial Consideration of the Neuro-retinal Lesion. HARVEY CUSHING, M. D., AND JAMES BORDLEY, M. D., Baltimore. *American Journal of Medical Sciences*, October, 1908.

Drs. Cushing and Bordley report a case of uremia which showed a marked improvement in the mental and ocular symptoms after a subtemporal decompression, but later died of a cerebral hæmorrhage. The choked disk is believed to be due to a backing of the cerebrospinal fluid under increased tension into the investing meningeal sheath of the optic nerve, because of its rapid disappearance after decompression.

They conclude by suggesting the propriety of permanent decompression in selected instances of renal disease, when medical measure or lumbar puncture have failed to relieve existing cerebral (uremic) symptoms, or when blindness is threatened owing to rapidly advancing degenerative changes of the neuro-retinal tissues. WM. R. CUBBINS.

Cause of Sudden Fall in Blood Pressure While Exploring the Common Bile Duct. J. LOUIS RANSOHOFF, M. D., Cincinnati. *Annals of Surgery*, October, 1908.

Dr. Ransohoff has found, by a series of experiments on rabbits, that when traction is made upon the gastro-hepatic ligament in such a manner as to cause an obstruction of the portal vein, that there is an immediate fall in the blood pressure of from 20–40 mm. of Hg. He also found this to be true when the portal vein was separately obstructed by a clip. Later the blood pressure in human patients was taken during common duct operations, and it was found to be the case that when the portal vein was obstructed the blood pressure fell 60-40 mm. of Hg. In both animals and human beings it was noted that if the traction was removed, the blood pressure gradually returned to normal.

WM. R. CUBBINS.

Tumors of Adrenal Origin, with Particular Reference to Hypernephroma of the Kidney. By H. C. MOFFITT, M. D. *Boston Medical and Surgical Journal*, 1908, vol. 159, Oct. 8.

Moffitt reports eight cases of this condition occurring in his practice. The cases emphasize certain points with reference to diagnosis and treatment which have been dwelt on extensively of late by other writers. First, that there are no pathognomonic signs. A diagnosis, especially in the early stages, must be made by a process of exclusion. Two of the cases, one of which was a boy of fourteen, showed extensive arteriosclerosis. This suggests again the importance of blood-pressure determinations in all cases where a suspected kidney lesion exists. Hematuria was the most important early sign. Metastases occurred in three instances as late manifestations. Only two of the eight cases were operated upon. They have remained well seven and fifteen months respectively.

GEORGE E. BEILBY.

Notes on the Arrest of Hepatic Hæmorrhage Due to Trauma. J. HOGARTH PRINGLE, Glasgow. *Annals of Surgery*, October, 1908.

Mr. Pringle reports eight cases of rupture of the liver in which there was severe hæmorrhage upon opening the abdominal cavity, which he believes to be due to the lowered intraabdominal pressure. This hæmorrhage he controlled in his later cases by compressing the portal vein and hepatic artery at the foramen of Winslow, with the fingers of an assistant, while the peritoneal cavity was freed of blood and the wounds in the liver located. The wounds in the liver were then either packed or sewed with coarse material so that the hæmorrhage was checked. He did not notice shock or collapse in any of the cases, as was reported by Ponfick after a series of experiments, and in some experiments carried out in rabbits shock was never present when these vessels were ligated. WM. R. CUBBINS.

A Contribution to the Study of Tuberculin in Orthopedic Practice. CHARLES OGILVY, M. D., New York. *American Journal of Orthopedic Surgery*, August, 1908.

Dr. Ogilvy reports 200 cases in which the Calmette-Ophthalmo-Tuberculin test was used with excellent results and no serious complications. The test he believes when used in conjunction with the clinical symptoms is of positive diagnostic value and urges its more frequent employment. Especial emphasis is placed upon the technic of the preparation and the fact that only one drop should be instilled into the lower conjunctival sac without touching the outer lids or lashes and avoidance of tears which inhibit or nullify the action.

He also reports a number of tubercular joint lesions in which minimal doses of tuberculin were given, and draws the following conclusions:

1. By means of the opsonic index we have learned the importance of these small doses of tuberculin and the time at which they should be administered. But this having been learned, it is by no means necessary nor is it practicable to follow up the treatment with control indices.

2. For the diagnosis of tubercular bone and joint disease, the opsonic index is of little practical value.

3. Tuberculin in small doses at proper intervals is of undoubted value in the treatment of selected cases of tuberculous bone and joint infection.

4. The rise of the opsonic index is accompanied by an improvement in the local and general condition of the patient if no secondary infection exists.

5. While there are discharging sinuses and mixed infections, the opsonic index may be raised by the use of tuberculin without an improvement of the general or local conditions.

6. The opsonic index will prove of value in determining the advisability of discontinuing the mechanical treatment.

7. The opsonic index is of value in determining the prognosis in tuberculous bone and joint disease.

WM. R. CUBBINS.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF GYNECOLOGY

UNDER THE CHARGE OF

J. CLARENCE WEBSTER, M. D. — E. C. DUDLEY, M. D.
J. C. HOLLISTER, M. D. — GEO. DE TARNOWSKY, M. D.
GERRY R. HOLDEN, M. D. — CAREY CULBERTSON, M. D.

Spontaneous Rupture of the Rectum with Uterine Prolapsus. DR. HENRI ZARATE. *Revue de la Clinique Obstetricale et Gynecologigue*, Buenos Aires, 1908.

A woman 29 years old, multipara, had been suffering during the past seven years from prolapsus uteri. While walking down stairs she tripped and slid down a number of steps. She was picked up unconscious and taken to hospital in a condition of profound shock.

Examination of the perineum showed complete prolapsus uteri; six feet of small intestine protruded through the rectum. Reduction of protrusion per rectum was instituted first, then laparotomy was immediately performed. A laceration of the anterior wall of the rectum 12 cm. long was found, its lower angle being near the cul-de-sac of Douglas. The cul-de-sac itself was torn for a distance of 4 cm.

Treatment consisted in closing muscularis and mucosa of the rectum with fine silk, the peritoneal coat being united separately. A Mikulicz drain was left in the cul-de-sac for 48 hours.

Uneventful recovery after slight local peritonitis of 4 days' duration. GEO. DE TARNOWSKY.

Hernia of the Female Genitalia. (Hernies des organes génitaux de la femme.) TEDENAT. *Archives générales de Chirurgie*, June, 1908. Pp. 647.

The author reports a case of hernia of the uterus, one of hernia of the ovary, and one of hernia of the tube. He discusses their complications and their treatment. Jouneff-Popoff reports two cases of strangulated hernia of the fallopian tube occurring on the right side. A fallopian tube with some omentum constituted the contents of each hernial sac. The first patient, 69 years of age, had had since early childhood a right, reducible inguinal hernia. Symptoms of inflammation had at times been present. For the last three years, the hernia had become irreducible. Five days before admission to the hospital she had pain, nausea, and vomiting. The tumor was the size of an apple, painful, distended. Fluctuation was present. Operation. Local cocaine anæsthesia. Upon incision of the sac there was an outflow of sanguinolent fluid. In the sac could be seen the fallopian tube, congested, compressed at its base, adherent to the sac. In tugging slightly, the ovary was exposed. Further a piece of omentum was adherent to the sac. After ligation the tube was removed, likewise the ovary and the prolapsed portion of the omentum. The sac was excised, the inguinal canal was closed.

Second Case. Patient 38 years of age, in good health; first menses at 13, regular ever since. Had 9 normal labors, four miscarriages. Last pregnancy was three years ago. After jumping from a height of one meter, she immediately felt an intense pain in right groin. A tumor appeared there at the same time. This was the first appearance of the tumor. No vomiting, no abdominal distension, no painful micturition. Examination showed in the right inguinal fold a swelling of the volume of a walnut, tense, painful, dull on compression, immobile, limited above by Poupart's ligament. The skin showed some discoloration. Both inguinal canals and the left crural canal were slightly distended No impulse on coughing. Diagnosis, hernia of the omentum. Operation. Chloroform anæsthesia. On opening the sac there is an outflow of a small quantity of serous hæmoratic fluid. The distal end of the right tube was present in the sac. It is œdematous and adherent to the walls of the sac. It does not show at its neck any evidence of gangrene. The tube was reduced into the abdominal cavity. The sac was excised. Recovery.

AIMÉ PAUL HEINECK.

Arteriosclerosis of the Uterus. CHARLES M. REES, M. D. *The American Journal of Obstetrics*, November, 1908.

Under this heading the author cites three cases. During the operations performed, the uterine and ovarian arteries were noted to be prominent and tortuous. The diagnosis of arteriosclerosis was confirmed in two of the cases by the microscope, while in the third case the diagnosis was macroscopic.

He says "when we recall the muscular arrangement of the uterus, and remember the fact that this organ is subjected to the most radical structural changes during the life of a child-bearing woman of any organ in her body, offering at one time resistance to the blood-supply, and again relaxation which admits of easy access of blood, the arteries alternately dilating and contracting, and with this process more or less frequently repeated, truly a condition is obtained, which is most favorable for the development of a localized physiologic arteriosclerosis. In a fair proportion of cases, this physiological change degenerates into a

pathological one. The sclerosed arteries become so weak that they are no longer capable of standing the blood-pressure, and give away with hæmorrhages from the uterus, which may be sufficient to cause the death of the woman, and certainly to so deplete her that permanent invalidism is produced. Curettement, in arteriosclerosis of the uterus, except for its immediate effect (and this is very temporary), increases the liability to hæmorrhage. All preparations of ergot increase the bleeding by raising the arterial tension of the inelastic vessels."

Reference is given to a paper by Dr. Frank F. Simpson on "Unusual Dilatation of the Corunal Blood-vessels" read before the American Association of Obstetricians and Gynecologists, in New York, 1905. In an abstract from SURGERY, GYNECOLOGY AND OBSTETRICS, Sept. 1906, Cruveilier and Rokitansky are mentioned as the first to report such cases, to which the name "apoplexis uteri" was given by Cruveilier.

In conclusion the author emphasizes the following facts: First, that a diagnosis of arteriosclerosis of the uterus is difficult to make, and can only be made where it is possible to exclude every other cause of hæmorrhage from the uterus, and by microscopical examination of scrapings from the uterus, in which sclerosed capilliaries are found, or finally from sections of such a uterus after its removal.

Second, arteriosclerosis, as a definite cause of hæmorrhage from the uterus, occurring in women between the ages of 40 and 50, and among those who have borne children, is of greater importance than has generally been determined.

Third, that in a fair proportion of cases the hæmorrhages from the uterus are in themselves sufficient to endanger the life of a woman, and can be made to yield only to hysterectomy.

Fourth, that with the uncertainty of diagnosis even after examinations of a section from the cervix and scrapings from the uterus, which show no evidence of malignancy, in women between the ages of 40 and 50 who have borne children, and suffer with frequently recurring hæmorrhages, hysterectomy is justified.

FRANK W. VAN KIRK.

Ovarian Cysts and Menstruation. (Kystes de l'ovaire et menstruation.) EUDES. *Archives générales de Chirurgie*, 1908, vol. ii, p. 635.

Simple unilateral ovarian cysts do not modify menstruation. Unilateral ovarian cysts, malignant in type, follow most always the same rule. At times, however, these malignant cysts may determine various disturbances, affecting the regularity of the flow, affecting its abundance, as well as the accompanying pains. However, amenorrhea is never caused. In women who have passed the menopause, unilateral cysts can determine hæmorrhages that simulate the reappearance of the flow. Bilateral cysts may not disturb the menses. Bilateral cysts can at times cause amenorrhea. Amenorrhea occurs only in the evolution of bilateral ovarian cysts that have caused complete destruction of the ovarian tissue, or when the cyst has become the seat of torsion, of a suppurative inflammation, or has determined symptoms of peritoneal inflammation.

Amenorrhoea can also occur if the patient's general condition is poor. The amenorrhoea will be permanent if dependent on complete destruction of ovarian tissue. If dependent on the other mentioned causes, it will be temporary, persisting for one or two months then followed by more or less disturbed menses, unless the cachexia be of sufficient intensity to itself cause suppression of the menses.

There is a certain relation existing between the disturbances of menstruation and late development of an ovarian cyst. It is frequently in the course of the menses that the tumor or the pain and complication of the cyst appear; torsion, ascites, peritonitis. It is usually during the menses that the volume of the tumor and the intensity of the pain increase.

AIMÉ PAUL HEINECK.

Neoplasms of the Uterine Round Ligament. (Tumeurs du ligament rond.) G. DESNIER. *Thèse*, Paris, 1906.

Most of these neoplasms are solid in nature. Histologically, they are fibro-myomatous in type, analagous to the fibro-myomata of the uterus. The author has been able to collect 76 cases. These tumors in location may be extra-abdominal, may be intra-abdominal. The former are easy to diagnose. They are intimately related to the gynecological life of the patient. Pregnancy influences their development. They should always be extirpated, as cancerous degeneration of the neoplasm is to be feared. To avoid retroversion, the extirpation should be followed by an appropriate statical operation.

AIMÉ PAUL HEINECK.

Vaginal Hysterectomy for Caseous Tuberculosis of Uterus and Adnexa, with Tubercular Ulceration and Papillomata of the Cervix. DR. A. ZAMFROGNINI. *La Ginecologia Moderna*, Genoa, August, 1908.

Patient 37 years old, married at 17, no pregnancies. Menses abruptly stopped at the age of 19, following which patient had symptoms of cellulitis lasting two months. A latent interval of seventeen years now succeeded, during which time patient remained in good health. In June, 1907, she began to fail, and after several months of medical treatment, was referred to the gynecological clinic. Examination revealed the presence of cervical papillomata and a uterus in anteversio-flexion, bound down by adhesions.

The operation was extremely difficult on account of the density of the adhesions, caseous pus and debris were found in the cul-de-sac, no trace of the ovaries remained. After removal of the uterus and tubes, it was found that the pelvic cavity was entirely walled off by fibrous tissue. The entire cavity was packed with iodoform gauze and repacked either daily or on alternate days for a period of three months.

The pathological diagnosis was caseous tuberculosis of the adnexa and chronic pelvi-peritonitis, caseous endometritis, chronic primary tuberculosis of the cervix, of the mixed ulcerative and papillomatous types.

Patient is now in excellent health and gaining weight.

GEO. DE TARNOWSKY.

Ovarian Insufficiency and Transplantation of Ovarian Tissue. (Insuffisance ovarienne et greffes d'ovaires.) *Tsilklice, Thèse*, Paris, 1907.

Ovarian tissue has been transplanted in the peritoneal cavity and in the kidney. Without doubt, some of these implantations have been successful. When successful, atrophy of the uterus does not occur.

Ovarian tissue has been transplanted in chickens and the proof that these transplantations were successful is that after transplantation the chicken has laid eggs which hatched chickens having the same color characteristics as those that had furnished the grafts. Morris reports an extraordinary case in which he removed the sclerotic ovaries in the patient and then implanted upon the broad ligaments of the same patient the ovaries of a III-para that he operated for prolapsis uteri. Four months after the patient in whom the ovaries had been implanted had regular menses; four years after she gave birth to a girl baby. The experiments of many others have shown the possibility of ovarian transplantation in animals. These grafts may be from autografts, may be heterografts.

Different procedures are employed. Grafts may be implanted in the uterus, in the peritoneal cavity, or subcutaneously. The results of ovarian grafts are the lessening of pain, the reappearance of the menses, and regularity of the menses. In a few cases, pregnancy has followed. In some, there has been slight or on modification of the general state.

AIMÉ PAUL HEINECK.

Diffuse Adenoma of the Cervix Uteri Simulating Cancer. (Adénome diffus du col utérin simulant un cancer.) HARTMANN ET LECÈNE. *Revue de gynécologie et d'obstétrique*, Mai, 1908.

The authors report the observation of a patient suffering from serous, fetid, sanguinolent vaginal discharges. Upon palpation, one could feel a rounded, ulcerated, fetid mass occupying the entire vaginal portion of the cervix. The vagina and the round ligaments were normal. The diagnosis of epithelioma was made. Curettage was performed followed by an abdominal colpohysterectomy. Cure.

Histological examination showed that the neoplasm was a diffuse adenoma of the cervical mucosa, apparently originating from the mucous glands of the cervical canal. It is an uncommon condition. Only two other cases are reported. (Morestin and Mansfield.)

AIMÉ PAUL HEINECK.

Kraurosis Vulvae. JAYLE. *Presse Medicale*, 1907.

Vulvo-vaginal leukoplakia, clinically and histologically identical with buccal leukoplakia, is of syphilitic origin. Vulvar leukoplakia almost always accompanies kraurosis vulvæ. Histologically, the two conditions present related features. According to Pillet and Perrin they are two degrees of the same affection; in one the epithelial lesions predominate, in the other, the dermic lesions predominate.

Like leukoplakia, kraurosis results from specific inflammation. They both predispose to epitheliomatous degeneration. Prognosis, therefore, must be guarded. Mercurial treatment must be tried in these cases. It is without influence upon the developed lesions. It cures the lesions while they are evoluting. Surgical treatment is useful only if one is treating cicatricial lesions without epitheliomatous degeneration. If the lesions are carcinomatous in character, the prognosis is very bad. X-rays seem to have given good results in a few cases of vulvo-vaginal leukoplakia, as well as in cases of kraurosis vulvæ. AIMÉ PAUL HEINECK.

Uterine Endoscopy. (L'endoscopie utérine.) ROBERT JACQUES. *La Clinique*, 17 Juillet, 1908.

Uterine endoscopy is an invaluable aid to diagnosis of intra-uterine disease. It has no associated dangers. It can furnish valuable information and it is easy of execution.

In gynecology, hysteroscopy also allows us to classify endometritis into two categories: non-vegetating endometritis, and vegetating endometritis. The latter yield to curettage. By this hysteroscopy it is possible to make a precise diagnosis of intra-uterine tumors.

In obstetrics, the hysteroscope reveals the presence of retained placental tissue, enables us to see such uterine perforations as are consecutive to criminal abortive measures. It can be used as an auxiliary to intra-uterine therapeutic, enabling us to treat alterations of the uterine mucosa. AIMÉ PAUL HEINECK.

Anterior Abdominal Colpohysterotomy for Irreducible Uterine Inversion. (Colpo hystérotomie abdominale antérieure contre l'inversion utérine irréductible.) KIRIAC. *Semaine gynéc.*, May, 1908.

The author employs the following technique:

Close to the inverted uterine orifice, he makes a transverse incision, involving only the serosa. Second, by means of blunt dissection and with the aid of the fingers a flap is elevated and retracted forward. This dissection is continued until the bladder has been placed out of danger and the walls of the anterior vaginal cul-de-sac well exposed. Third, he buttonholes the anterior vaginal cul-de-sac, enlarges his incision cautiously, doing an anterior colpotomy. In separating the margins of this incision the inverted uterus is seen. Then he introduces the index into the uterine cavity and with the knife or scissors incises the uterine wall as high as possible. (Anterior hysterotomy.) The uterus is then reduced. Once the uterus is in position the wound is closed with two layers of sutures, one for the muscular and one for the serosa.

Utero-adnexial Syphilis. (Syphilis utéro-annexielle.) PADE. *Archiv. di Cinec.*, Juillet, 1907.

During the secondary and tertiary periods syphilis may give birth to metrorrhagia. These uterine hæmorrhages are observed more frequently during the tertiary period. This metrorrhagia affects the nutrition of the entire organism, having a special influence upon the nervous and vascular lesions of the female genitalia are produced by syphilis. Chief among these are syphilitic arteritis with consecutive uterine sclerosis. When a case of uterine hæmorrhage that does not yield to any treatment is found, one should think of syphilis and make the therapeutic test. AIMÉ PAUL HEINECK.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF OBSTETRICS

UNDER THE CHARGE OF

C. S. Bacon, M. D. — Ralph Waldo Lobenstine, M. D.
Heliodor Schiller, M. D. — Hugo Ehrenfest, M. D.

The Treatment of Placenta Previa. Prof. M. Henkel. *Archiv. f. Gynaecologie, Berlin*, bund 86, heft 3.

In the discussion of maternal mortality in placenat previa, Henkel refers to the results obtained at several of the largest clinics in Europe, Zweifel presents a list of 178 cases with 7.8 per cent mortality; Bürger and Graf, 344 cases, with 5.85 per cent mortality; Hammerschlag, 191 cases, with 6.28 per cent mortality; Füth-Koblenz, 618 cases, with a mortality of 19.7 per cent.

The great difference, in the results given above, is difficult to explain. Henkel believes, from his personal investigation of several hundred cases of abortion at the Gyn. Poliklinik der König, Frauenklinik in Berlin, that many abortions are due to placenta previa; i. e., that they occur because of the abnormal situation of the placenta. Most cases of threatened abortion, that quiet down, and later present the condition of placenta previa, are of the "lateral" or "marginal" varieties.

According to the Bürger-Graf statistics, 11.7 per cent of the cases were primigravidæ, and 68.7 per cent did not reach term.

About 50 per cent of the infants are born alive, but their chances are diminished by prematurity and low vitality at birth.

In some clinics, the fœtal death rate is even higher than this. In Schauta's clinic, it is 54.9 per cent, and in Hammerschlag's clinic, 84 per cent.

The severest type of placenta previa is a "placenta previa centralis" with the cervix closed. Henkel advises in these cases *firm tamponage with sterile gauze*. He believes that the colpeurynter is risky and uncertain in this class. If the tamponage is carried out properly, it does *not* increase the morbidity. Unfortunately, it is in this type of case that it is often most difficult to start up uterine contractions. Repeated tamponage may be required and most careful asepsis must be maintained. The ordinary cotton-balls, as used by the general practitioner, are dangerous.

The treatment given above is only to be carried out when the membranes are intact. When once these have ruptured, it is possible for the bleeding to take place internally.

It is better to do a version or to use a rubber balloon in these cases; but the former — a Braxton-Hicks' version — is far preferable to the bag, as it is much the safer. The expert can perform a Braxton-Hicks' version with the use of only one finger (where the cervix is but slightly dilated). After drawing down the foot, it is advisable to keep hold of it, as thus further bleeding can be absolutely checked and tractions can be regularly and systematically exerted. Great care must be used not to tear the cervix, for the cervical tissue is especially friable in placenta previa centralis.

Henkel is much opposed to rapid manual dilatation and the Bossi dilator.

Rupturing the membranes is only permissible in the presence of a "lateral" or "slightly marginal placenta previa," and with uterine contractions going on. In these cases, if the pains cease, the pressure is removed and the bleeding may recur.

The classical Cæsarean section should only be performed in exceptional cases. Henkel, however, is a great admirer of the vaginal Cæsarean section. He pays but little attention to the life of the child. He has performed the operation, so far, in five cases, with but little extra-bleeding. In bad cases he perforates the after-coming head, and usually makes but one (namely, the anterior) incision.

The further treatment of placenta previa consists in the early use of ergotin hypodermically; hot douching, with or without tamponade of uterus and vagina. This tamponade of the uterus is difficult to do correctly, and fails occasionally to check the bleeding, even in the best of hands.

In atonic conditions, the uterine arteries may be grasped with Muzeaux clamps.

Bad tears in cervix should be sutured. The great danger after delivery is the development of sepsis.

Conclusion. Placenta previa should be early diagnosed, and should then be sent at once to the hospital.

Ralph Waldo Lobenstine.

A Case of Gonorrhoea in the Newborn. A. Hamm. *Beitr. z. Geb. & Gyn.*, B. xiii, H. 11.

A seventh para came July 17, 1907, in the lying-in ward. In the vagina was found yellow pus containing diplococci, which were Gram negative. The membranes ruptured 13 hours before the birth of the baby. Both eyes were treated with a 2 per cent silver nitrate solution. On the seventh day, July 24th, the left eye looked red and swollen, and discharged a purulent secretion containing Gram negative diplococci.

Gonococci grew upon ascites-agar. The interphalangeal joint of the right thumb was very tender. July 25th, in the above mentioned joint was distinct

fluctuation, there was also an abscess in the subcutis above the left radio-metacarpal joint. Both abscesses were incised, the yellow pus contained gonococci in pure culture. In the evening of the same day, an abscess appeared above the right external malleolus. July 26th, the condition of the eye was much improved. The abscess above the right ankle was incised. The two other abscesses discharged pus freely. After two weeks, the child seemed to be completely recovered. It weighed at birth 2,980 gr., the day it left the hospital 2,900 gr. Sometime afterwards the mother reported that several weeks after leaving the hospital, the right hand became swollen, but she did not bring the child to the hospital for fear of the knife. This is a case of typical pyæmia with metastases in the joints, tendon-sheaths, and skin. The French called it "gonohemie."

The simultaneous appearance of the gonorrhœa of the eye and the abscesses is very peculiar. In the few cases which were observed before, the affections in the joints or metastases did not occur before the second or third week, and in most cases later. The prognosis is a favorable one, mostly restitutio at integrum, seldom ankylosis or meningitis or endocarditi. The best treatment is an early incision. It prevents a new invasion of bacteria, which is important, as in gonorrhœal infection an active immunization of the body does not take place. H. SCHILLER.

Remarks Based upon 14 Conservative Cæsarean Sections. J. MOUCHOTTE, Paris. *Annales de Gynécologie et d'obstétrique, November, 1908.*

These operations were performed at the Bandelocque clinic in Paris, during the past two years. Both maternal and fœtal recoveries were 100 per cent.

A brief description is given of the fourteen cases. The indications for operation were (*a*) Markedly rachitic pelves in seven cases; (*b*) Moderately rachitic pelves in five cases; (*c*) Generally contracted non-rachitic pelves in two cases.

Time to operate. According to Pinard (the head of the Bandelocque clinic), operation should *not* anticipate labor, but should be performed *as soon* as there is sufficient cervical dilatation to insure good drainage in the puerperium. These early operations can always be carried out in those cases presenting an "absolute obstruction"; but this is not always wise in the cases with merely a "relative obstruction." In this latter group of cases, one is inclined to delay, in order to determine how much mature can accomplish of herself. The tendency is, therefore, to wait *too* long, until the patient is fagged out and the lower zone has become very thin.

In this list of Mouchotte's, four labors were prolonged; viz., 22 hours, 37 hours, 38 hours, and four days, respectively. Mouchotte does not believe that ruptured membranes are, necessarily, a contraindication to the operation. However, he points out very clearly the fact, that the nine women operated upon after the rupture of the membranes, had a post-operative temperature reaction, while the five cases with "membranes intact," ran a normal temperature curve.

Technique. In all fourteen cases, the long abdominal incision was used, with the withdrawal of the uterus from the abdominal cavity before delivering the fœtus. Mouchotte believes this method to be more surgical, despite the frequent present-day cry for the incision of the uterus "in situ." By this method, the peritoneal cavity may be kept entirely free from contamination.

The uterine incision is a longitudinal one, entirely in the fundal region. The placenta was found presenting in the wound in several cases, and Mouchotte advises *against* plunging the hand through the placenta to extract the child (as in a placenta previa centralis) but suggests stripping the placenta away from the uterine wall, and then passing the hand into the cavity of the uterus, at the edge of the placenta. At times there is difficulty in the complete removal of the membranes, when these are unduly adherent. Should any uterine packing be used, this can, as a rule, be withdrawn soon after the completion of the operation.

In suturing the uterus, two rows of catgut are used: (*a*) Interrupted sutures passed through the entire musculature, (*b*) A continuous suture, involving the peritoneal covering and outer muscular layers.

Finally, the author believes that the peritoneal cavity should always be temporarily drained through the abdominal wound. RALPH WALDO LOBENSTINE.

Multiple Pregnancies in Double Uteri, with Report of a Case of Uterus Didelphys Containing a Simultaneous Full-term Pregnancy in Each Uterus. C. F. JELLINGHAUS. Bulletin of the Lying-in Hospital of the City of New York.

Jellinghaus divides these cases into two classes; the first where there is an external indication — in this he includes uterus didelphys and uterus bicornis,— and the second class, in which there is no external indication, and in this he places uterus bilocularis. He reports a delivery of twins from a uterus didelphys, one child being delivered by high forceps, the other by low forceps. One child weighed 2,400 gms., the other 2,000 gms., and both were alive and well when they left the hospital on the fifteenth day with the mother. Jellinghaus has collected from the literature 52 cases (including above) of a similar nature. He finds that in double uteri one twin pregnancy comes in every twelve births, therefore that the percentage of twin pregnancies is much higher in double uteri than in normal uteri. "The multiple pregnancy is most likely to occur in didelphys and least liable to occur in bicornis." "Multiple pregnancies are much less liable to go to full term in double uteri than in normal uteri. Multiple pregnancies in double uteri are less liable to go to full term than single pregnancies in double uteri. On the other hand, if one twin aborts in a normal uterus the other rarely goes on to full term. In a double uterus this is much more liable to happen." "Didelphys is most likely to go to full term on both sides, septus least likely to go to full term." "Septus is most likely to abort on both sides, didelphys least likely." Of the 56 cases, operative interference was mentioned in 19. Two deaths in 52 cases, one of sepsis, one of ruptured uterus.

C. G. GRULEE.

BOOK REVIEWS

DISEASES OF THE RECTUM, ANUS AND SIGMOID COLON. By F. Swinford Edwards, F. R. C. S. London: J. & A. Churchill; Philadelphia: P. Blakiston's Son & Co., 1908.

This third edition of Edwards' Diseases of the Rectum and Anus is a complete revision of the last edition of sixteen years ago. Many of the parts have been completely rewritten and in every way there has been an attempt to bring the book up to date. The addition of cases from the personal experience of Edwards adds to the value of the book for those who will make a special study of the subject. It is a volume of over 400 pages with clear type and fairly well illustrated. A chapter on malignant diseases is a particulary satisfactory one.

PRACTICAL FEVER NURSING. By Edward C. Register, M. D., Professor of the Practice of Medicine in the North Carolina Medical College and Chief Physician to St. Peter's Hospital. Cloth, 352 pages with illustrations. Philadelphia: W. B. Saunders Co.

This is a most excellent work and covers the nursing and care of the febrile ailments completely.

General considerations and conditions common to all fevers are taken up first, followed by a chapter on prevention of fevers.

Then the separate diseases and fevers are taken up and described, and enough of the anatomy and symptoms of each given to make them understood.

Of course the treatment and care of each disease is full and complete.

Eighty pages are devoted to typhoid fever alone, and deservedly so, because of the prevalence and importance of this form of fever.

The subject matter is clearly written and well arranged, and the illustrations are uniformly good.

Directors of Training Schools for Nurses will make no mistake in adopting this work as a text-book, and the practitioner might find many valuable hints in it.

HENRY W. CHENEY.

ANÆSTHETICS; THEIR USES AND ADMINISTRATION. By Dudley Wilmott Buxton, M. D., B. S., London, England. Fourth edition. Philadelphia: P. Blakiston's Son and Company.

This book is so well and favorably known that nothing need be said in its praise. The present edition has been carefully revised, and as before represents only the author's personal experience and opinions derived from it. Considerable space is also devoted to an account of recent scientific research on anæsthetics, and the new subjects dealt with are dosimetry in chloroform, the use of ethyl chloride as a general anæsthetic, and the production of anæsthesia by spinal injection. We cannot recommend the book too highly to those who use anæsthetics, no matter how often, and to those who have to supervise their administration.

FRED C. ZAPFFE.

PATHOLOGICAL TECHNIQUE. A Practical Manual for Workers in Pathological Histology and Bacteriology. By Frank B. Mallory, A. M., M. D., Associate Professor of Pathology, Harvard University Medical School, and James H. Wright, A. M., M. D., S. D., Assistant Professor of Pathology, Harvard University Medical School. Fourth edition. Philadelphia: W. B. Saunders Company.

Mallory and Wright's manual has been a standard guide in laboratory work in pathology and bacteriology for more than a decade, and a general review would be superfluous.

Laboratory workers will be glad to know that the new edition is ready, as a number of new methods have been introduced since the former edition was issued. The style of the manual has in no wise been changed. A few of the older methods have been omitted and the new ones added.

PRINCIPLES AND PRACTICES OF GYNECOLOGY. By E. C. Dudley, A. M., M. D., Professor of Gynecology, Northwestern University Medical School, Chicago. Fifth edition. Philadelphia and New York: Lea & Febiger.

The present edition of this well-known text-book is very similar, in general appearance, to the previous edition. The book has received, however, a thorough overhauling, a number of chapters having been rewritten, certain others condensed, and additions made to others. Forty new illustrations and full page plates have been added. An introductory chapter and a chapter on incon-

tinence of urine in women have been added. The same general plan has been followed as in the former editions, i. e., the grouping of pathological conditions, and not the consideration together of the various disorders of a given organ. The surgical instrument plates have been omitted.

SURGERY. By John Allan Wyeth, M. D., LL. D. 864 illustrations. Marion Sims Wyeth & Co., New York, 1908.

The first issue of Wyeth's standard work made its appearance in 1887 and was followed by two later editions, the last in 1900.

The present enlarged and revised edition, by amicable arrangement with D. Appleton and Company, is controlled by the author more directly than is usual with medical books, and bears the imprint of *Marion Sims Wyeth & Co., Publishers*, the valuable plates and illustrations of the former owners having been secured by the Wyeths themselves. There are 57 colored plates, and in all 864 illustrations, some photographic, some original engravings, and a few collected from new European sources.

The work contains a carefully prepared chapter on the surgery of the eye, and another on that of the ear.

The present edition of this admirable book is thoroughly modernized, containing the latest information on new technique, new pathology, and new diagnostic measures, as well as the best of older methods.

The section relating to anæsthesia gives photographs of the latest apparatus for gas, ether, and chloroform, as well as careful descriptions of rectal anæsthesia, spinal anæsthesia, infiltration methods, etc.

Friends of the late Dr. Mellish, of Dr. Ochsner's clinic, will be interested to note that the author refers, at length, to some of his writings on anæsthesia.

After covering in less than half the volume the well-known fields of older surgery, the bones, vessels, skull, amputations, etc., the author has devoted the remaining larger part to the newer fields of operative work, now mostly in the hands of the few trained specialists, the surgery of the thyroid, of the chest and mediastinum, the stomach and intestines, kidneys, bladder, and prostate, the spine and nervous system, etc.

In these various sections, while the authorship has remained that of Wyeth, the latest ideas of advanced workers, and if needed, their exact language, and illustrations, have been introduced to give as perfect an idea of each author's technique as if written by himself.

Thus from the work can be gleaned an idea of the best modern technique, quite as well as from one in which various chapters are written by special contributors.

Thus the reader will find descriptions of Kocher's goiter work, of Mayo's pylorectomy, Tuttle's interesting plates of operative work on rectal cancer, Young's prostate technique, and that of many others from various sources.

The "surgical diseases," neoplasms, and surgical pathology, including a separate chapter on the blood, and an appendix of formulæ and details, are placed at the end of the book.

This book has become a standard and very valuable reference work.

WYLLYS ANDREWS.

A SYSTEM OF SYPHILIS. In six volumes. Edited by D'Arcy Power, M. B., Oxon., F. R. C. S., and J. Keogh Murphy, M. D., M. C., Cantab., F. R. C. S. With an introduction by Jonathan Hutchinson, F. R. S. Vol. 1. London and New York: Oxford University Press.

The first volume of this magnificent and comprehensive work is before us. This volume is a fine exhibition of the book maker's art, and reflects great credit on the Oxford Press, notwithstanding its well-known reputation for the most chaste and artistic examples of book publication. The authors acknowledge, for the direct color photographs now used for the first time to illustrate clinical conditions, their indebtedness to Dr. Arnold Moritz and to Mr. Tubbs.

The editors state that syphilis has been considered a special disease for too long a time. It has continued to be called "specific," when less was known of its nature than about many other disorders, and it has been dealt with as though it differed in its course from all other affections. The advance in medicine, due to improvements in pathology, has enabled syphilis to be classed with the infective diseases, and experiment has discovered the micro-organism which causes it.

The time has come, therefore, when syphilis can be discussed, and its signs, symptoms, and treatment can be described from the standpoint of modern medicine and surgery. To this end the editors have obtained the assistance of writers who have made their reputation in the general fields of medicine, surgery, ophthalmology, gynecology, and public health, as well as of others who have had unrivalled opportunities for studying the early stages of venereal diseases. The individual articles have thus gained in breadth of view without losing in depth of knowledge.

The aspects of syphilis are protean, and its

results are seen in every tissue of the body. Each writer finds more than enough to tell about its effects in his own branch of practice; and whilst each has been allowed a free hand, an attempt has been made to harmonize the general views expressed. Some conflict of opinion is both necessary and desirable; necessary, because no two persons draw the same conclusions from similar sets of facts; desirable, because a difference of opinion often stimulates thought and leads to further advance.

It will be found, too, that there is some repetition, especially in regard to the treatment of syphilis. Such repetition was thought to be a good feature, since the prevention and cure of the disease are of the first importance to the community, and methods which can be carried out in the public services and in our great charities are not always suitable or desirable in private practice.

Some attempt, too, has been made to deal exhaustively with the subject of syphilis by including articles upon "Syphilis and Life Insurance"; "Syphilis in its Medico-legal Aspects"; and "The Mental Affections of syphilis"; upon all, of which too little stress has been laid in the past.

The historical side of the question has been dealt with most ably by Dr. Iwan Bloch, who has devoted much time and work to elucidate the source of the European pandemic at the end of the fifteenth century.

Mr. Jonathan Hutchinson has summed up in his introduction the mature conclusions of a lifetime devoted to a study of syphilis. His words will be read with the respect due to the father of modern syphilology in England, and every one interested in the subject will rejoice to think that he has lived to see syphilis founded on a sure basis of experiment, and freed for ever from the charlatanism which has long surrounded it. The existence of a book containing an introduction by Mr. Hutchinson and an article by Prof. Metchnikoff shows how uninterrupted has been the progress of the scientific knowledge of syphilis during the last fifty years

By giving a list of the contents, the reviewer feels he can present to the reader the most comprehensive idea of the scope of the present volume.

Introduction. By Jonathan Hutchinson, F. R. S.; History of Syphilis. By Iwan Bloch, M. D., Berlin. The Beginning of the Disease in the Old World; its Introduction from the New World. Arguments as to the Pre-columbian Origin of Syphilis. The Early History of Syphilis in Europe. The Later History of Syphilis in Europe.

The Microbiology of Syphilis. By Elie Metchnikoff, Sous-Directeur de l'Institut Pasteur, Chef de Service de Microbiologie de L'Institut Pasteur. Historical Account of Researches on the Microbiology of Syphilis. Discovery of the Spirillum of Syphilis. Topography of the Spirochæte Pallida; its Connection with the Cells of its Host. The Occurrence of Spirochæte Pallida in Syphilitic Lesions. Natural History of the Micro-organism of Syphilis. Technical Methods in Connection with the Organism of Syphilis. Criticisms as to the Part Taken by the Spirillum of Schaudinn in the Causation of Syphilis. Practical Application of the Recognition of the Organism of Syphilis.

The General Pathology of Syphilis. By F. W. Andrewes, M. D., Oxon., F. R. C. P., Pathologist to St. Bartholomew's Hospital. The General Pathology of Syphilis. The General Histology of Syphilis. The Problems of Immunity in Syphilis.

The Primary Lesions and Early Secondary Symptoms of Syphilis as Seen in the Male. By F. L. Lambkin, Colonel R. A. M. C., Lecturer on Syphilology, R. A. M. C. College. The Primary Genital Lesion and Extra-genital Chancres. The Intermediate and Early Secondary Stages.

The Primary Lesions and Early Secondary Symptoms as Seen in the Female. By Arthur Shillitoe, F. R. C. S., Surgeon London Lock Hospital. Initial Genital Lesions. Extra-genital Primary Lesions. The Early Manifestations of Secondary Syphilis. Treatment.

Congenital Syphilis. By G. F. Still, M. D., Cantab., F. R. C. B., Professor of Diseases of Children, King's College, etc. History and Ætiology. Symptoms of Congenital Syphilis. Pathology. Treatment of the Congenital Disease.

BOOKS RECEIVED

PRACTICAL POINTS OF ANÆSTHESIA. By Frederick-Emil Neef, B. S., B. L., M. L., M. D., New York. New York: Surgery Publishing Company.

SURGICAL MEMOIRS. By James G. Mumford, M. D. New York: Moffat, Yard and Company, 1908.

ARTERIOSCLEROSIS. By Louis M. Warfield, A. B., M. D. C. V. Mosby Medical Book and Publishing Company, St. Louis, Mo.: 1908.

SUGGESTIVE THERAPEUTICS, APPLIED HYPNOTISM, PSYCHIC SCIENCE. By Henry S. Munro, M. D. Second edition. St. Louis, Mo.: C. V. Mosby Medical Book and Publishing Company, 1908.

GONORRHOEA IN WOMEN. By Palmer Findlay. St. Louis, Mo.: C. V. Mosby Medical Book and Publishing Company, 1908.

GENITO-URINARY DISEASES AND SYPHILIS. By Edgar G. Ballenger, M. D. Atlanta, Ga.: E. W. Allen & Co. 1908. Price, $3.00.

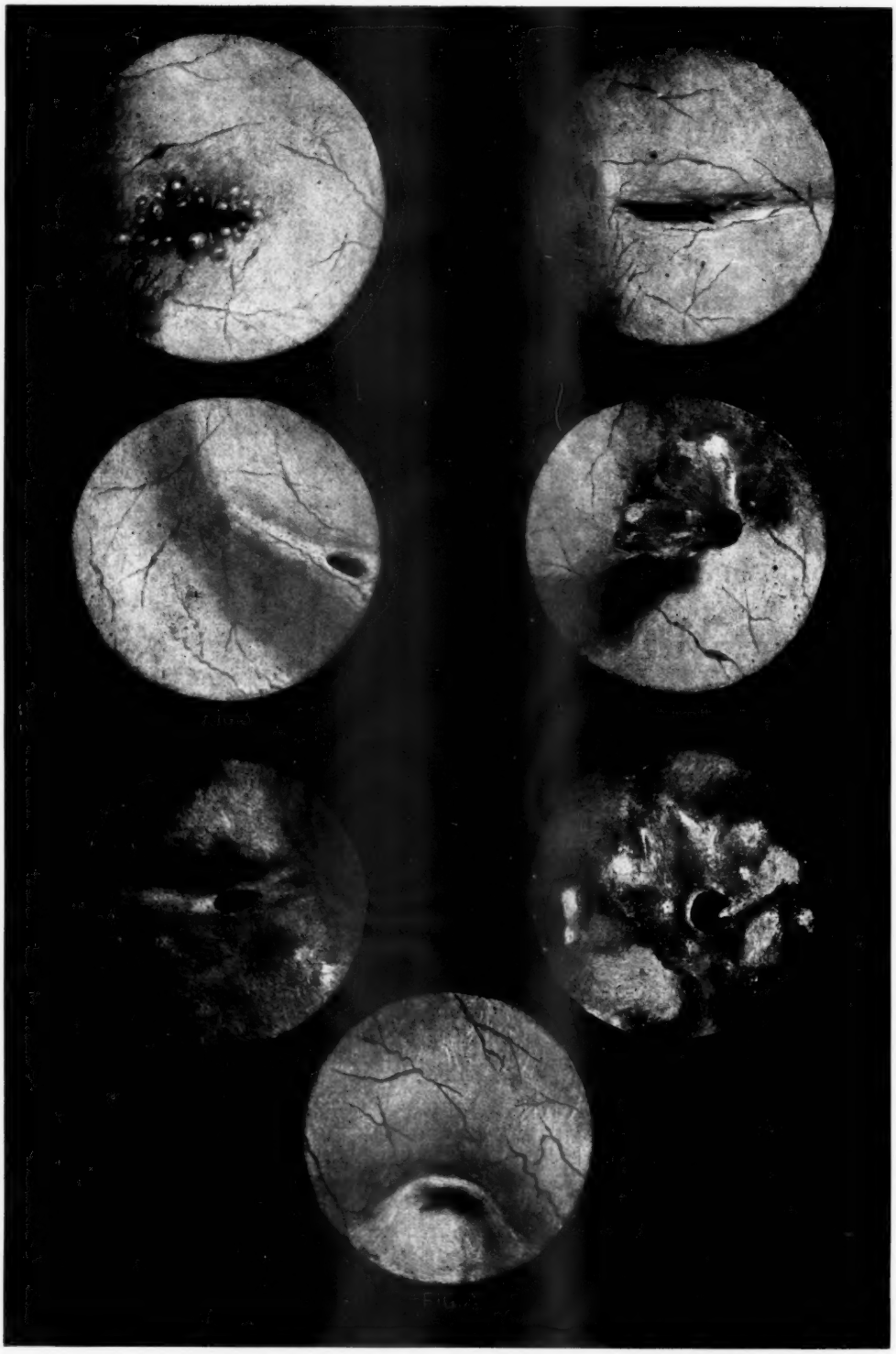

Fig. 1. Case I. Left Ureteral Orifice Before Operation

Fig. 2. Case I. Left Ureteral Orifice 3 Weeks After Operation

Fig. 3. Case II. Right Ureteral Orifice

Fig. 4. Case II. Left Ureteral Orifice

Fig. 5. Case III. Right Ureteral Orifice

Fig. 6. Case III. Left Ureteral Orifice

Fig. 7. Case IV. Left Ureteral Orifice